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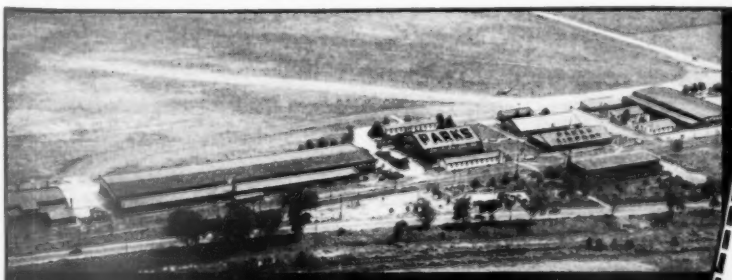

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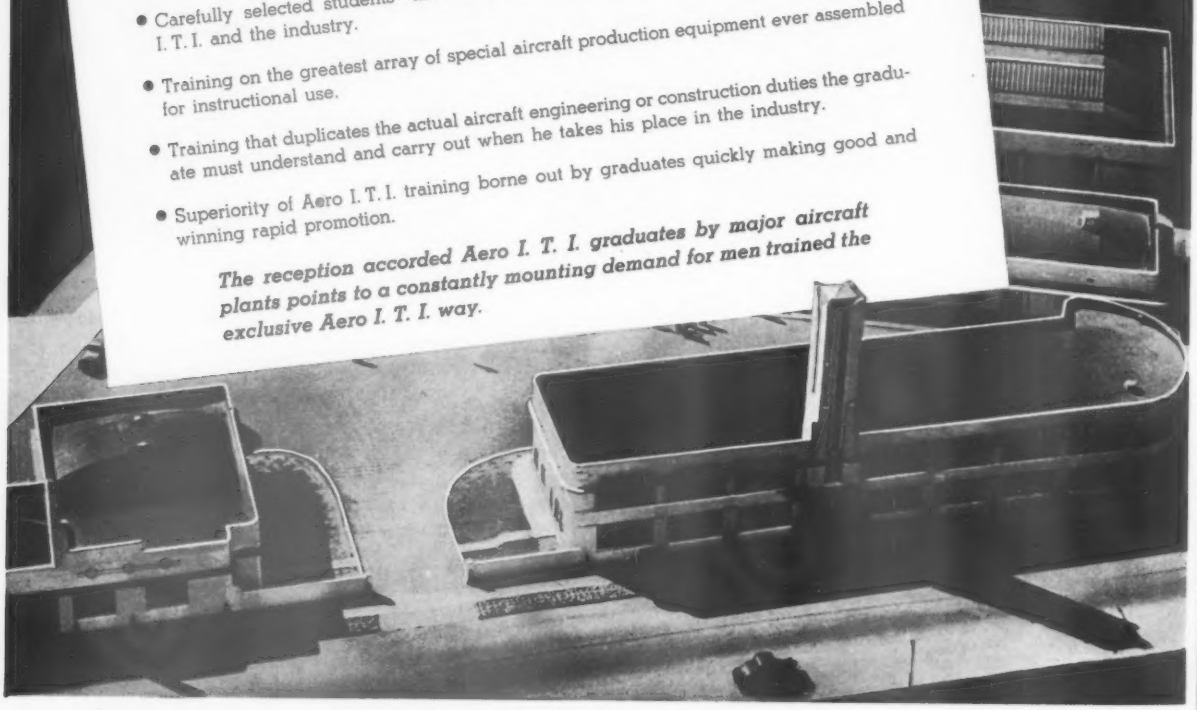

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1937			
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Aug.	4	2	2
Sept.	20	17	7
Oct.	4	3	2
Nov.	2	2	2
Dec.	29	7	5
1938			
Jan.	7	14	6
Feb.	1	9	7
Mar.	40	16	6
Apr.	6	13	3
May	6	12	6
June	30	5	4
TOTAL	154	107	26

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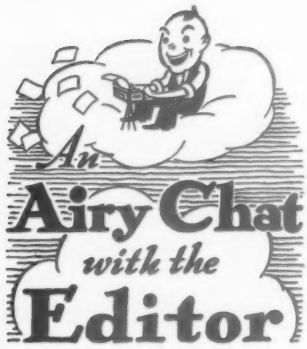

WHEN Corrigan made his heroic flight across the Atlantic and into Ireland, he was justly first page copy in every American newspaper. It was a marvelous achievement, probably one of the greatest flights in history—everything considered.

There is little that we can add to the mass of pro-Corrigan dope that has already been published, except to express our great admiration for a modest, ambitious man—with real guts.

* * *

THE king of the greaseballs has made undying history. To a follower of the aviation game, the trans-Atlantic flight of Corrigan takes on a new thrill because he was essentially a mechanic and secondly a pilot. We hope that this will settle the time old controversy of Pilot vs. Mechanic.

* * *

WE got a big kick out of the fact that when he came home, he started hunting for a job in an airplane factory. As we were going to press American Airlines called to say they had just hired him as co-pilot.

* * *

SAFETY, we are beginning to believe, is a comparative and not an absolute factor. In short, safety is expressed in terms of percentages rather than in absolute units. Thus, we frequently hear in heated discussions that "Plane No. 1 is safer than Plane No. 2," for such and such a reason. Perhaps, after this mental attitude has been dispelled, we will get down to real figures and facts that speak for real safety.

* * *

TIMES and methods change—and not always for the better. It is difficult at times to decide whether some startling innovation can be regarded as an improvement or simply a change. This is in accord with the accepted philosophy that the world cannot stand still—it must go ahead or retreat. Nature abhors stagnation, if you get what I mean.

* * *

WHAT brought up this little philosophy was the distinct and right-

(*Continued on page* 68)

POPULAR AVIATION

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Cover Photograph: "Men with Wings" pilot by Cy La Tour

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THE FUTURE OF OUR AIR FORCE

It is said in high military circles that fleets of huge bombers like the Sikorsky XPBS-1 above will replace battleships.

by JOHN C. A. WATKINS
Aviation Editor of the Baltimore (Md.) Sun.

★

Here, we believe, is the most startling prediction written to date. This article is woven around facts and plans known to exist in Uncle Sam's future military scheme.

MILITARY aviation in the United States is approaching a cross-roads where a choice of the future path of progress involves what probably will be the most fateful decision in the history of aerial warfare. That choice must be made within the next five years.

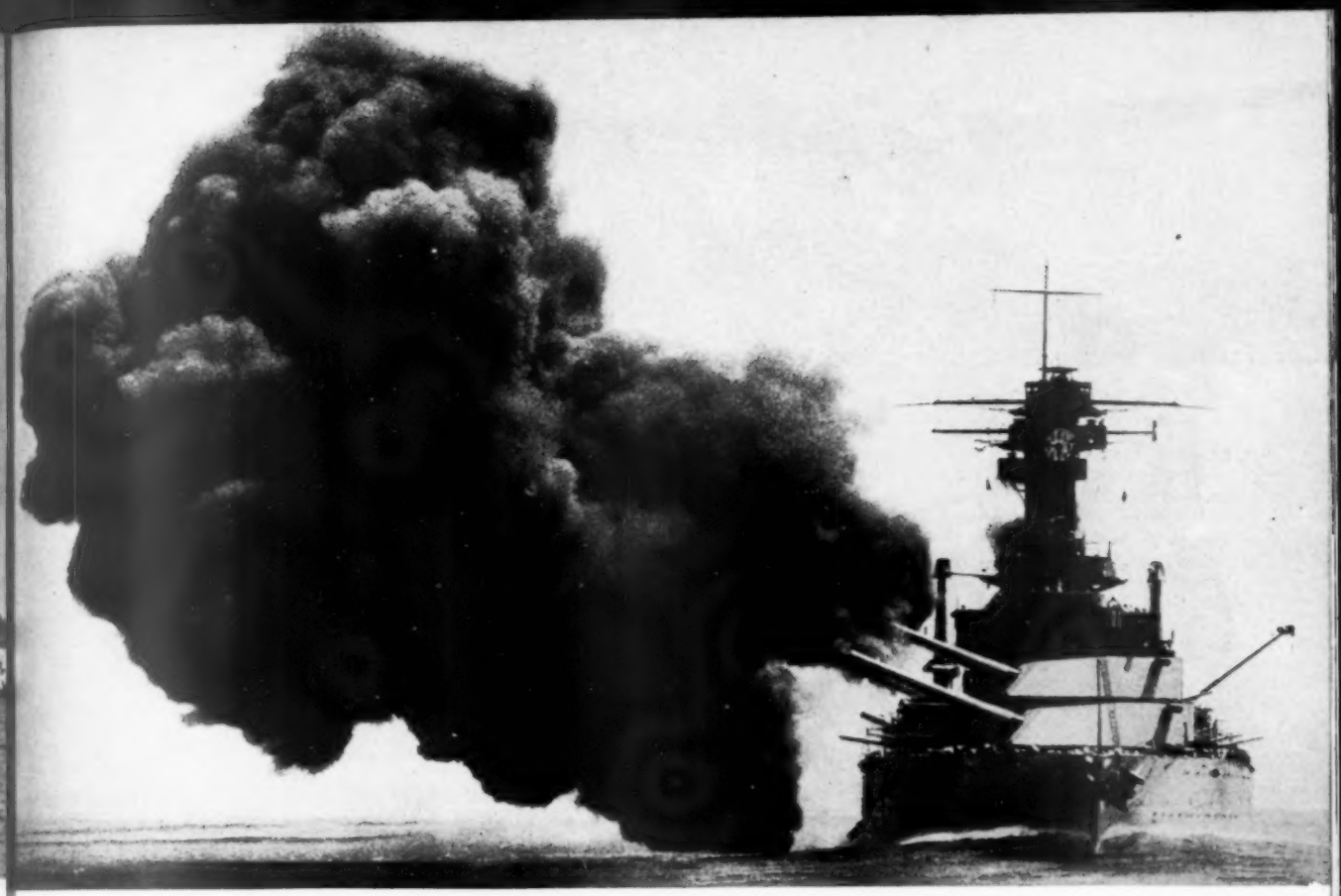
There are two roads open. The selection of either will mean complete revamping of the aerial defense of this country. Either will mean great changes. And, regardless of which path is taken, military aviation as we have known it will be a thing of the past.

In one direction lies the separate air force—the same separate air force, combining the men and equipment of the air services of both the Army and the Navy under one head, which has been advocated for years by some authorities, but separate because of actual necessity. In the other lies the assumption by the Navy of the whole problem of protecting us from aerial attack.

There is no alternative to this forced choice. For purely physical reasons, entirely apart from any personal desires on the part of the men involved, and disregarding the time-accentuated beliefs held by those who now direct national defense, the change will be made.

The approaching revolution in American military aviation actually began some time ago, with the delivery to the Air Corps of the first four-engined

That the Navy has plans for Alaska is evidenced by mass flights up there (left).



Not a few experts see the doom of the highly costly battleship in favor of cheaper, faster planes.

Boeing bomber (promptly christened *Flying Fortress* by an excited press) which crashed at Wright Field during its tests, killing Major Ployer P. Hill and fatally injuring Leslie Tower, test pilot for the manufacturer.

The *Flying Fortress* revolutionized the entire national defense system, as a few far-sighted air officers had predicted, although few others realized it at the time, and writers since have largely ignored the far-reaching consequences of its creation.

Small as it seems now, compared to the super-flying fortress, its successor—the Boeing B-15, which actually was begun first—and others yet to come, the B-17 actually transformed the air forces of this country. They had been a purely defensive arm, intended to back up the Navy if an enemy fleet and its auxiliaries succeeded in breaking through the Navy's cordon of steel. They became, instead an offensive weapon.

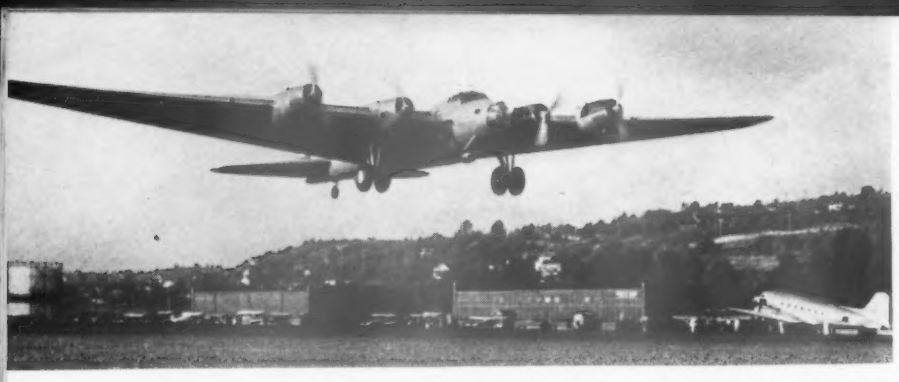
They became such because it was the first American bomber, and probably the first of any nation, capable of efficient offensive action over wide stretches of sea. It made the air forces the first line of defense. It relegated the Navy, whether the admirals will admit it or not, to a secondary position. It reversed the roles. The air forces became, because of its existence, the arm that will take the first step to defend the United States, by striking at the heart of the enemy. The Navy assumed the role of second line of defense.

At the moment, of course, there are not enough *Flying Fortresses* in existence to enable the air forces to assume their new function. Soon, however, there will be. There will be more of the present type, and there will be dozens—we hope hundreds—of even greater bombers—larger, faster, and with far greater range and capacity.

These airplanes will force a change because they have made, and will continue to make, the air forces just as different, with problems as peculiarly their own, as the Army is different than the Navy, and as its problems are largely peculiar to itself.

This progress will compel the government, whether it is a pro-Navy government and wants it or not, to form an entirely separate air force. It will be, and must be, an organization the sole job of which is the preparation for

The Army "showed the Navy" recently when Air Corps bombers "bombed" the Rex at sea.



The Air Corps is developing giant bombers like the Boeing B-15 above to strike at invaders as far away from the United States' vulnerable coastal area as possible.

probably inevitable aerial warfare confronting us Americans at some unkown time in the future. The present obsolete system, in which the aerial forces are part Army and part Navy, each imbued and handicapped with those branches' old tactics of warfare and traditions, will have to be rejected.

This is so certain that it is surprising no one has pointed it out before, not even those who have fought for years for a separate air force, for much less valid reasons and with far less valid arguments.

Apart from the increased efficiency of action which experts will admit privately must result inevitably from such a change, there will be also, they believe, increased efficiency in development.

The Army and the Navy, in recent years, have been developing their airplanes along somewhat similar lines—where the Army has long-range *Flying Fortresses*, the Navy has long-range patrol bombers—and there has been a consequent duplication of effort which is wasteful and must be eliminated.

It seems fairly certain that the ranking officers of the Navy have foreseen what is approaching along the aerial front, although they have constantly and consistently decried the value of aircraft in offensive action, because recently there has been a definite trend toward the assumption by the sea arm of the aerial defense problem.

The Navy always has been charged with the responsibility of being the first line of defense. It is jealously guarding that responsibility in the face of its enemy, the airplane, and is fighting to preserve its status. Obviously aware that an enemy of this country no longer will be stopped by surface craft, but will fly over them, it is building up a large air force of its own to preserve its position.

The Army, on the other hand, always has been charged with the defense of the immediate coastal area. It has assumed that the most certain defense, now that it doesn't seem likely the enemy will ever come within the comparatively short range of its big coast defense guns, would be to strike at the invaders as far away from the coastal area as possible. For this purpose, the Air Corps has developed the four-engined Boeings, and even larger bombers, which have an extremely long range that will enable them to fly far out to sea and stop an invading fleet long before it nears the coast.

The Navy resents this policy as an attempt to take away what it considers its rightful duties, and in answer has spurred its own development of long-range aircraft. An indication that it is now going directly into the Army's camp is the rumor, as yet unconfirmed but persistent enough to warrant consideration, that it has ordered 50 "flying fortresses" of its own, to be based at Dutch Harbor, Alaska, and flown by the Marines.

The whole trouble is that there is no clearly defined policy which says who shall jump completely over the water and actually attack the enemy on his own ground. There should be no need for such a policy. The airplanes, even non-flyers in both services believe, should be directed by air men, in a single arm whose duty it would be to carry the war, even a defensive war, to the enemy territory.

Everyone concerned agrees that the present system is a ridiculous duplication of effort. Through petty jealousies between the admirals clinging to their hoary traditions, and the ground officers who are foolishly and inefficiently permitted to ham-string the air forces (of which they know little) desire to learn nothing and are suspicious, it is a childish and awful waste of the taxpayers' money.

Although the admirals and the ground officers don't want it, a separate air force will come. It should be charged with the strictly offensive phase of national defense. The Navy should back it up, and the Army should confine its duties to the actual defense, on the ground, of the country proper, should enemy soldiers actually gain a foothold on American soil.

The separate air force isn't coming this year, or next. There is nothing to justify the change right now, save the few Boeing bombers with which the Army Air Corps is armed, and the promise of those that are to come. These airplanes are a tiny nucleus of the coming air force.

And then, too, at the present time there is no power, or logical combination of powers, that has the airplanes which could stage a successful attack on this country. There is no argument here, and any effort to convince the public otherwise, in the eyes of many military men, is stupid, regardless of its source or motive.

Physically, such an invasion right now would be an impossibility. Military and Naval authorities are said to agree that the enemy couldn't bring enough troops to this country to conduct a successful war, because under present conditions our Army, Navy and their air services are adequate to prevent their landing. And a surface war is the only kind an invader could wage on this country at this time.

Regardless of the problems set up to be solved in the recent General Headquarters Air Force maneuvers, in which the enemy was supposed to have obtained a foothold at two points on the Eastern seaboard, our battle fleet is adequate to protect one coast, and our augmented air force the other. Although coastal cities might, and probably would, be subjected to bombardment by small, scattered groups of enemy aircraft which would slip through the net, the eventual outcome certainly would be disaster for the enemy.

But—and herein lies the reason for the change that is coming in the aerial defense of the United States—in five years the picture will have changed completely. By that time, this country will be as vulnerable to attack, from across either ocean, as France, for instance, is vulnerable to attack by Italy. Why?

(*Continued on page* 64)

Many military aviation authorities agree that the highly successful Boeing "Flying Fortress" has practically revolutionized this country's military plans for the future.

THE ARMY'S EYES

Latest Air Corps observation ship is this North American O-47A, now being delivered to Army bases.

Airports at

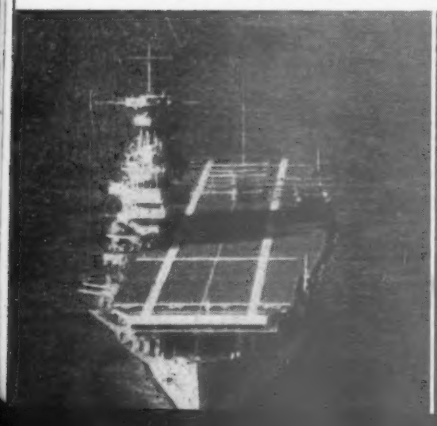
by J. B. HANCOCK
Bureau of Aeronautics, Navy Department.

This is probably the first time the "inside" story of the aircraft carrier has been told so completely. We hope you find the many surprises we did.

The above photograph was taken during recent Naval maneuvers in the Pacific. In the picture are three aircraft carriers with planes "at ready" on the flight deck.

When planes leave their carrier, it is at a certain latitude and longitude. Navy pilots must be expert navigators to find their floating base after flying hundreds of miles.

SIXTEEN years ago something was started when the Navy decided to convert the old collier *Jupiter* into an aircraft carrier. Her name was changed to *Langley*. A flight deck was built over her entire length, and the only landing gear known at that time was installed. As soon as she was completed the Naval aviators, who had been practicing landing ashore on a space marked off to the same dimensions as the flight deck, started to work out the technique of landing aboard. Up until the idea of aircraft carriers in the form of ships was conceived, the Navy had flown mostly seaplanes, and the pilots were referred to, both seriously and humorously, as "big boat pilots." Every conceivable variety of test was carried out on the *Langley* for the next five years. Intensive training was started in landplanes and it became the accepted thing for pilots, after practicing ashore, to fly out in all kinds of weather and land on the *Langley* while she was under way, in order to learn everything possible about operations under various weather conditions. However, it was not until 1927 that the *Saratoga* and *Lexington*, converted battle cruisers, were completed. In their design was included all the lessons which had been learned on the *Langley*. They were the last word in aviation ships, with flight decks 888 feet long and 105 feet wide at the amidship section, capable of a speed of 33 knots, and able to carry and operate about 75 airplanes each. This number of airplanes constitutes eight squadrons of 18 landplanes each. The aircraft carriers now accompany the fleet on all its opera-



One of the Navy's newest carriers is the U. S. S. Yorktown (below left). She weighs 19,900 tons compared to the 33,000-ton Saratoga.

First of the modern aircraft carriers, the U. S. S. Langley has been converted to an air tender (for big Consolidated patrol boats).

Sea

tions, which has allowed aviation to become a vital factor in the national defense.

The long flight deck extends over the entire top of the ship from stern to stern and is free from all obstructons, with the exception of an "island" on the starboard side, where, within a massive funnel enclosure, the masts, uptakes, turrets, and superstructure are located. In order that this extra weight on the starboard side will not tend to make the ship list, quantities of oil, gasoline, and water are carried on the port side below deck. When the gasoline and oil are consumed in large quantities, water ballast can be substituted.

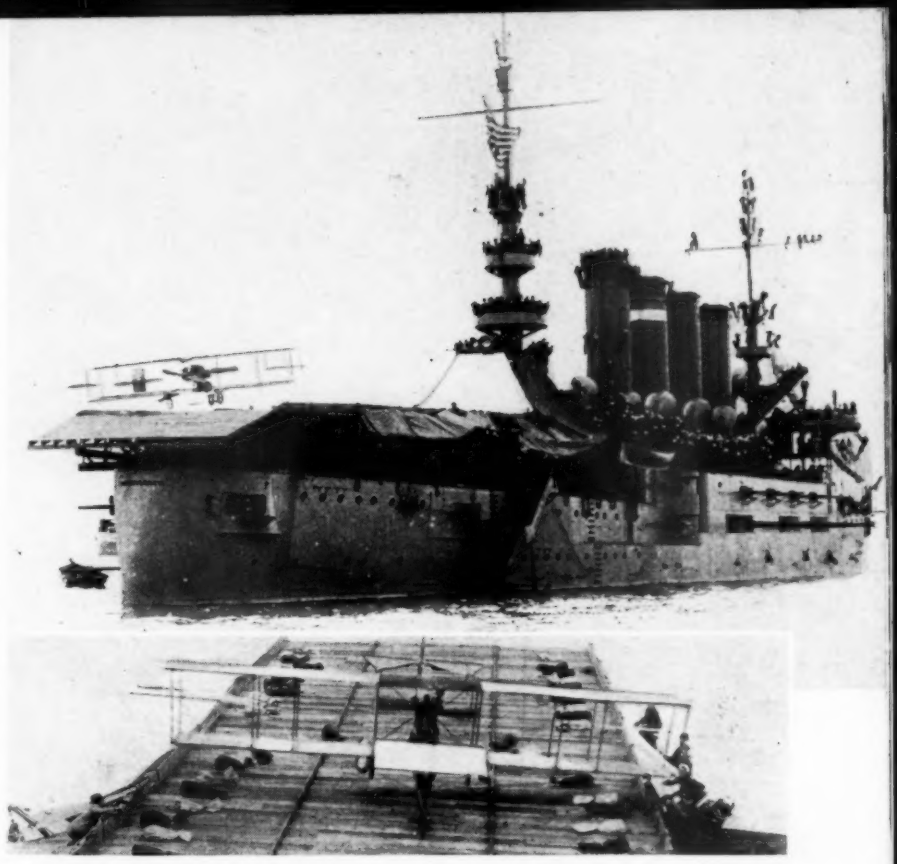
The interior of an aircraft carrier is quite different from the space below decks on other Naval vessels, for there are storage spaces for airplanes as well as cranes and elevators with which to hoist them to the flight deck. The crew's quarters are on the deck beneath the flying deck, and the hangar deck is below that, in this position receiving the protection of the two upper decks. Forward of the hangar deck there are eight decks from the hold to the flying deck. There are fully equipped aircraft machine shops and carpenter shops on board; a laboratory for testing engines, and shops for fabric work, doping and painting. There is a sheet metal shop, a plumbing shop, and sewing shop with more than forty sewing machines. The interiors of the *Saratoga* and *Lexington* are divided into more than 600 compartments. Of these, 117 are assigned to the supply department of the vessels. Thirty-one compartments are set aside for the storage of technical aviation material; 70 are assigned to the storage of ship's stores, equipage and provisions; and 16 compartments are used for the galley, bakery, butcher shop, general mess, issue room, and ship's store or "canteen."

These vessels are really floating airplane fields and electric generating plants combined. The propulsion machinery comprises 35,000 kilowatt turbine generator sets which supply current to eight powerful motors. The generators are operated by steam from sixteen oil-fired boilers. The eight motors are connected in pairs to each of the four propeller shafts. Each motor has a capacity of 22,500 h.p. and measures 15 feet in diameter. A total of 45,000 h.p. is delivered to each shaft, which drives the propeller blades at 317 r.p.m.

In addition, there are installed six 750 kilowatt direct current turbine generator sets which supply power for operating the steering gear, anchor windlass, ventilation fans, lighting, radio, telephone and telegraph systems. The elevators, searchlights, fire alarm system, cooking apparatus and refrigeration also are electrically operated. So powerful is the electric generating system of these carriers that in January, 1930, during a two-day period when the electric supply of the city of Tacoma, Washington, was turned off, the *Lexington,* tied up to the Baker Dock, supplied the entire city with electric current.

The *U.S.S. Ranger,* 14,500 ton displacement, and its sister ships *Yorktown* and *Enterprise,* of 19,900 ton displacement each, are, of course, small when compared with the 35,000-ton displacement of the *Saratoga* and *Lexington.*. However, the many lessons learned from the operations of the older and larger ships served as a guide in designing the new ones so that even though they are much smaller, they can carry and operate the same number of planes as the larger ships.

The squadrons of airplanes attached to the carriers spend several months of each year ashore, while the carriers themselves are at sea practicing gunnery, maneuvers, radio procedure, and the numerous other functions of all ships of the Navy. But being ashore does not mean rest for the pilots and the men of the Naval air service, for it is then that the gunnery and bombing practices for aircraft are carried out day and night until each person is as perfect and as efficient as practice can make him. When that point is reached, the practice goes on just the same, in order



The historically important photographs above depict the first landing by an airplane aboard a Naval vessel. The date was January 18, 1911. Eugene B. Ely made the famous landing aboard the U. S. S. Pennsylvania's specially constructed deck, later flew back.

The new U. S. S. Ranger is Uncle Sam's lightweight—14,500 tons. She carries a total of 80 warplanes.

Above is the pilots' ready room aboard the Saratoga. Here they get final flight instructions before takeoffs.

This is the well-equipped print shop of the Saratoga. Ship's orders and a daily newspaper are among the many publications printed in this shop.

Asbestos Jim's job is to get unconscious pilots out of burning airplanes that may crash on deck. He has special crash tools.

The Saratoga's barber shop has regular hours and prices, much like commercial shops ashore. Prices are substantially lower, though Naval personnel must pay for service.

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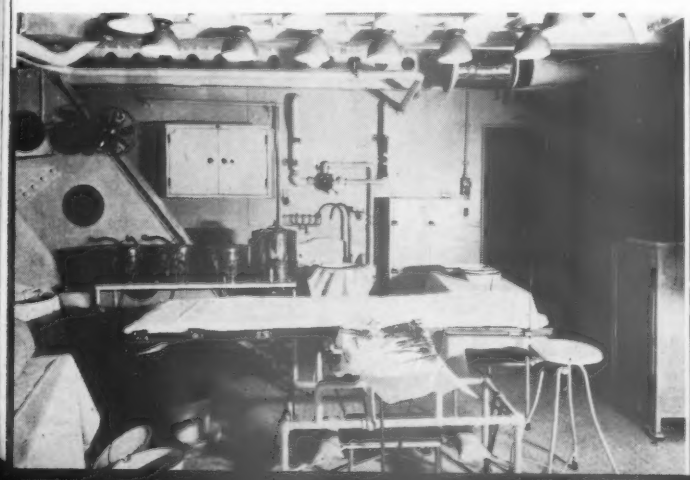
AIRPORTS AT SEA

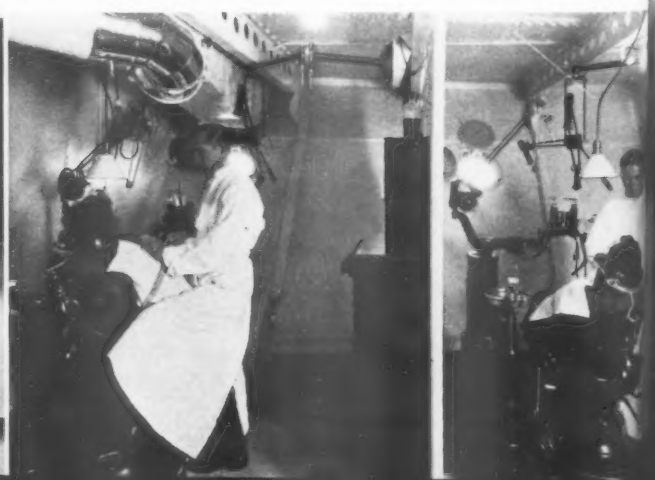
(*Continued from the preceding page*)

that no one will become rusty. This practice is carried out from ashore because it is the most economical way. If this routine training were carried out at sea, it would mean that the surface ships would have to take part, and for all our battleships and cruisers to steam out the hundreds of miles to sea daily would cost thousands of dollars which is saved by allowing the planes to take off from land, fly to see, carry out their problems and practices, then turn around and dash for their landing field. Especially is this true of the planes of the aircraft carriers, which, although few people realize it, are landplanes. Hence, it is quite normal for them to operate also from the ground. After months of intensive work ashore comes the usual annual maneuvers. Then the entire fleet goes to sea, and all the different training which has been carried out separately is put together like a jigsaw puzzle. Even the failure of one man may throw the picture out of line. One order misunderstood may mean the lives of a score of people. That is why

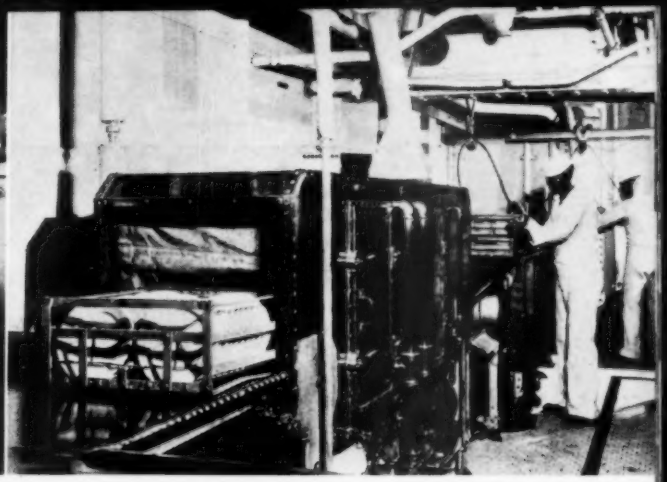
An aircraft carrier's medical department is well equipped for any emergency from a major operation to minor bruise.



Though the dentist's chair is probably the most dreaded seat aboard the Lexington, the ship's dental office is nevertheless one of the finest.



Here is where the flying sailors spend some of their most pleasant moments. It is the mess hall of the Saratoga. Note rims to keep plates on the tables.



They even have dish washing machines aboard aircraft carriers! Those in the above picture are in the crew's scullery.

Cleanliness is of the greatest importa...ce in the U. S. Navy. All refuse usually is burned instead of dumped overboard. Above is the Saratoga's large incinerator.

Wings or no wings, Navy airmen need shoes. This is the shoe repair shop aboard a carrier. Standard prices are charged.

no man ever fails to do his appointed job.

It is rather difficult to visualize the human element in connection with carriers, those marvels of engineering skill; but the human element is there. Every one of the 1500 officers and men aboard has his appointed task to perform. While the aircraft carriers are handled like any other ship of the Navy, they have the added function of serving the aviation activities carried aboard.

It should be most interesting to know something of the lives of the men on duty in the aircraft carriers. A 24-hour stretch during a fleet problem gives a concentrated picture. For during maneuvers the entire fleet is operated as near to war conditions as can be simulated. Actual war could not be carried out more seriously. The fleet is divided into two parts. The defending and enemy forces are generally designated by a color such as the "blue" fleet and the "orange" fleet. Here is how "war" is conducted:

For days the ships have been steaming under specific orders. Instructions on the outside of an oilskin covered envelope says, in this particular instance: "To be opened at Latitude 141°, Longitude 34°." When that point is reached, the com-

★

You send your laundry out while at sea in just the same manner as you would at home. Below are the steam pressing machines in the Saratoga's laundry.

Even tailors go to sea. In the ship's tailor shop below, officers and men can get uniforms and "civvies" overhauled.

mander-in-chief of the "blue" fleet breaks the seal, and at the same time in some other location the commander-in-chief of the "orange" fleet is breaking the seal on a similar envelope. Both find the problems outlined which they must solve. The "war" is on. Whatever the orders and problems may be, the main mission is always for each to find the other and to outwit or outmaneuver him when found. Imagine that you are aboard the *U.S.S. Saratoga*, a part of the defending or "blue" fleet. The huge carrier is proceeding to her prescribed position with all lights out. For two days more the ship steams full speed ahead, the men on watch, for the commander-in-chief has figured out from the problem that the "orange" fleet must be somewhere within a certain near latitude and longitude. All men off watch are catching a few hours' needed sleep, when suddenly through the loudspeaker system, to all parts of the ship, comes the staccato notes of the call, "Turn out!" Instantly there is action. Men roll from their hammocks to the deck, pulling on their clothing in jig time. But even in those few seconds another call is heard—"Flight Quarters!' Hundreds of men rush through the passageways of the ship, up the companionways, and on to the flight deck. Already the elevators are groaning upward with their loads of planes—fighters, scouts, and torpedo and bombing. All this is carried out with clock-like precision and in absolute darkness.

The officers gather in the Ready Room, pulling on their flight jackets and getting last minute orders. Its just like a huddle on a football field—every nerve is tingling. The coffee percolator is going full tilt; each man stands holding a cup of the steaming java in his hand while listening intently to his squadron commander's crisp orders. And then . . . "You know your jobs, men. There will be radio silence until we have contacted the enemy. Every man keep a sharp lookout—and remember, the orange fleet is our enemy. We are going out to get them. But bear in mind that they know as much about this game as you do."

While the last-minute details are being arranged in the Ready Room, the flight deck has been a scene of terrific activity. Weaving in and out among the 70 odd planes the mechanics and radiomen have been checking every mechanical detail. Practiced hands are run over the wires, controls are tested, and soon the ghost-like whine of the inertia starters cry through the darkness. The order to start the motors is given, and almost before the last word has been said, the first explosion is heard, followed in a split second by 10, 20, 30, and now 70 roars. The 888 feet of flight deck seems to support one vast dynamo. Regardless of this deafening roar each mechanics hears his own particular charge as truly as if it were the only one in operation. A slightly sour note to him is detected in an instant, and then and there he goes to the root of the trouble. He knows almost instinctively what it is; he is trained to "shoot trouble." An adjustment here or there, and the roaring purr which satisfies brings a slight look of relief to his grim face. How well he knows that on this engine he stakes his life, and that of the pilots! And he also knows that the pilot has utter confidence in him to have that engine just as it should be—perfect.

Suddenly a silence falls on the ship, which is still speeding through the darkness The engines have passed a satisfactory check; all gear is rapidly gone over—parachutes, rubber boats, life preservers, and emergency rations—for if anything should ge wrong and the plane be unable to get back to the ship to land, the only alternative would be to come down in the sea.

"All planes ready for flight, Sir," reports the leading chief machinist.

Each man stands by his plane—ready for the gruelling test ahead. An instant later, the voice again comes through the loud speakers:

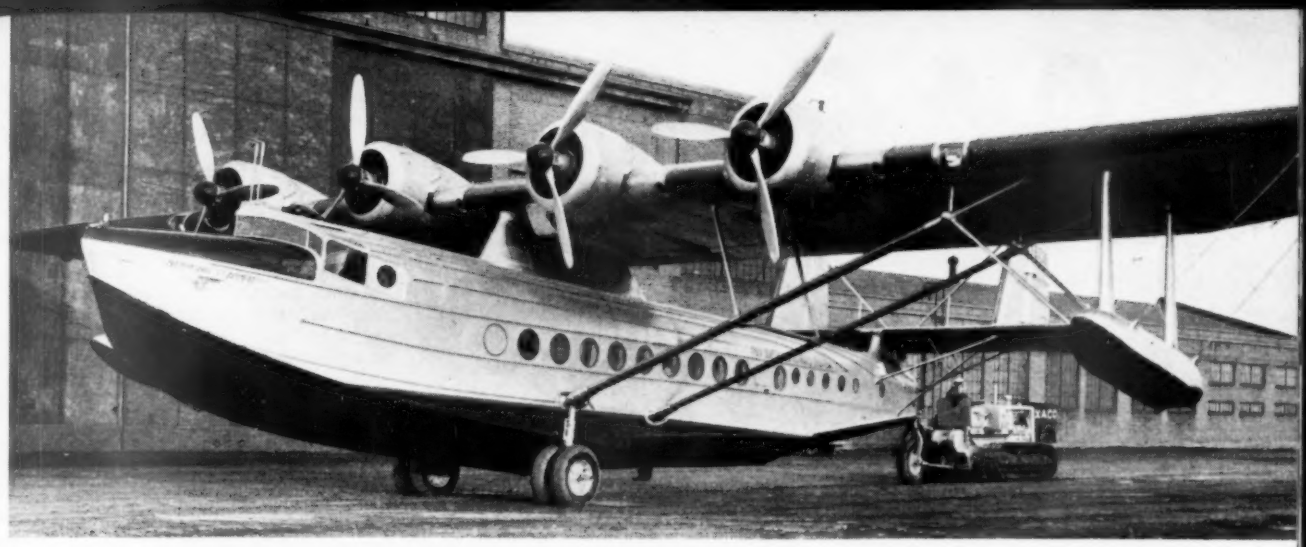
"Man the planes."

Forms stream out onto the deck from the Ready Room. Forms buckling the chin straps of the flying helmets. Winding their way familiarly through the maze of parked planes, they climb into the pilots' seats. Again the weird scream of the inertia starters, while the parachute belts are being snapped into place. A terrific roar bursts simultaneously from each plane. Chocks are pulled from under the wheels, and a siren blares forth. Instantly the plane in Number One position catches the signal from the flight officer and down the deck he roars, to be followed immediately by the second, then the third, until it is just one steady stream of airplanes. Out over the water and up in a steep climb to rendezvous into squadron formation in the inky darkness overhead. Eighteen planes to a squadron, and four squadrons in the air at the same time. Not only must they know exactly where to rendezvous, but each must know exactly where to rendezvous, but each must know his exact position in the formation, or else collide with other planes.

Now they are already only a dull roar somewhere out in the darkness. But these men who fly the Navy planes are more than pilots; they are also expert navigators, radio operators, gunners, and seamen. An hour passes, another half hour, then a pale pink flush appears in the east. Eyes are strained in all directions. The scouts were the first off the carrier, and with as great speed as the fighters, they have roared away on their mission. Just as day is breaking, 36 pairs of eyes see a line of tiny objects about 20 miles away. Now, immediately, they must get the word back to their fleet. Radio silence is broken. The squadron commander must get every possible important item into that first report. Here the training in seamanship and radio comes into play. His navigational knowledge has served him well so far, but now he must be able to recognize the type of ships which compose the enemy force. He must be able to deduce the number, the types, the probable speed and course—all from the silhouettes so far away that they look like toy ships. He determines all this in a matter of minutes—almost seconds—and radios the information to his commander-in-chief in order that the "blue" fleet may be most advantageously deployed and the course set so that the enemy will be encountered in a situation most advantageous to the defenders. The discovered enemy forces are not sitting idly by. They have sighted the defending squadrons. Already their fighters are taking the air from the carriers. Suddenly a group of scouts from the "orange" battleships appear high overhead. They have been carrying out their work while the defending planes have been doing theirs. The line of ships appears beneath. What a target! But orders are orders. A Navy-trained pilot will pass over seemingly easy targets to get to his objective, but he knows that he is but a part of a huge plan in which each man must do thoroughly and to the letter the job assigned to him. The enemy planes overhead have maneuvered into a position which is going to be darned uncomfortable for the "blue" scouts to get through to their objective. Anti-aircraft guns are blazing away below. Then, with a screaming of wires and propellers, the "blue" fighters appear from apparently nowhere. Down, down, they dive on the enemy scouts, with machine guns spitting. Got the drop on them that time! Umpires rule six of the nine "orange" scouts out of commission, or "shot down". The other three take cover in speed. The fighters seem to dart in every direction at once. More and more planes are taking off below. The defending scouts are over the line of enemy ships, diving and zooming and rechecking their first report, radioing all developments to their own fleet. The fighters are clearing the way with a fierce desperateness for the heavy torpedo and bombing planes which have arrived. Here they come . . . not one squadron but three. They have intercepted the radio message, and so have

(*Continued on page* 86)

"Junior, I told you to stop playing war!"



Pan American's "Bermuda Clipper" alternates with Imperial Airways in flying four round trips weekly.

BERMUDA—BY AIR

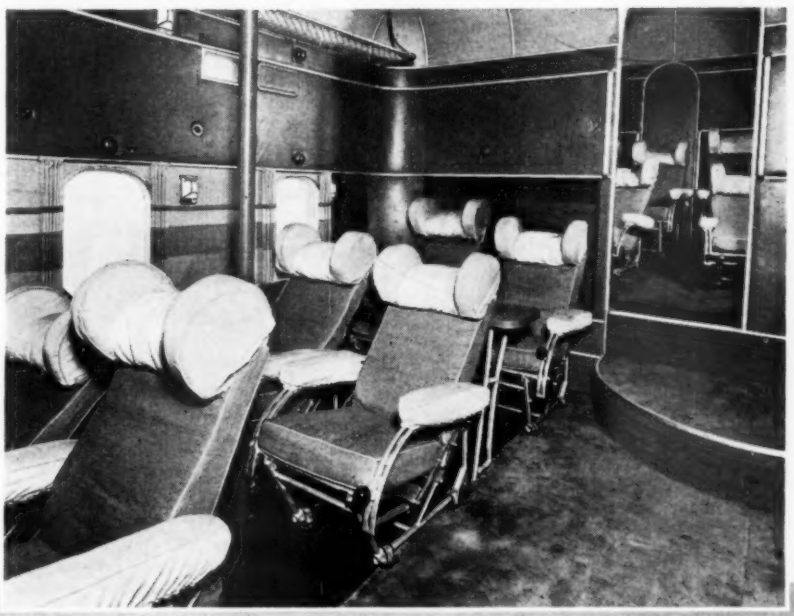
by MAX KARANT

Two airlines are carrying passengers out over the Atlantic. The New York-Bermuda run is a full-fledged ocean line in miniature.

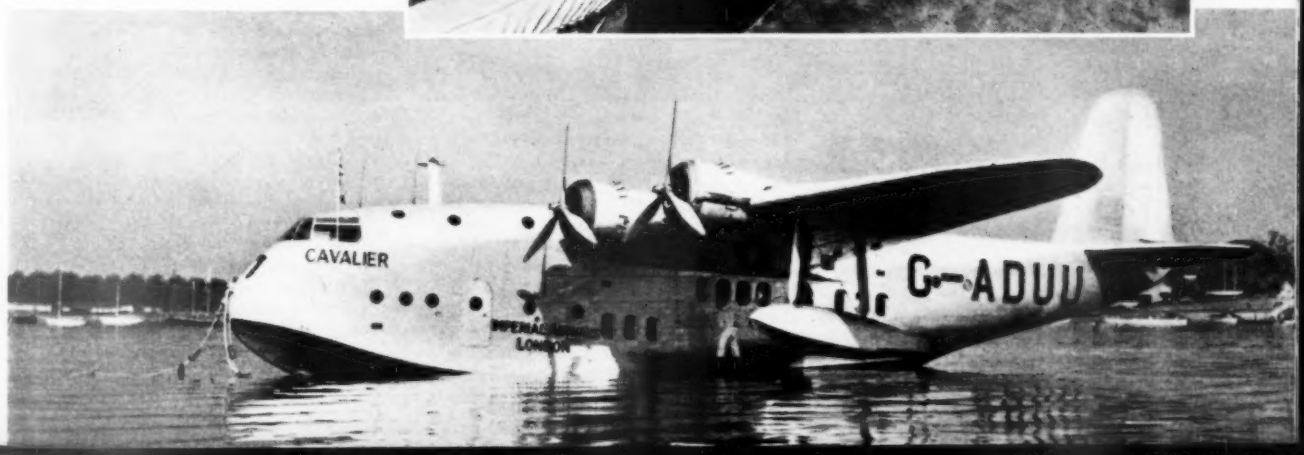
WE'VE talked a great deal recently about soon-to-start trans-Atlantic airline operations. In many respects, however, it seems we forgot to "look before we leaped," for trans-Atlantic airline operations have been in existence—complete to the carrying of passengers, mail and express—for many months now. That trans-Atlantic airline—between New York and Bermuda—has been so eminently successful that both the Imperial Airways (British) and Pan American Airways (American) crews now flying the route already have accepted the fact that New York-London operations are near only as a matter of course.

It is because of the fact that Americans today actually have access to a full-fledged trans-Atlantic airline (flown jointly by Pan American and Imperial) that the writer recently made the flight from the United States to Bermuda and return. It was an excellent opportunity to "fly to Europe" almost literally. All that was lacking was the dank fogs of

(*Continued on page* 80)



Short Brothers, builders of Cavalier, took great pains in behalf of the passenger. The adjustable individual seats (right) are masterpieces of comfort.



It Gets in Your B

by LEE GEHLBACH

The author, one of the country's most famous test pilots, has saved his life four times via parachute. Herewith his personally-written ideas on test flying.

The author (right) is shown above with Leroy Grumman, the manufacturer, before a flight.

THERE was a loud report like cannon fire and I looked up to see daylight in front of me where the solid aspect of a wing should have been. Stray bits of fabric and metal whizzed past me as I huddled down in the cockpit. This was no place to be, I decided, so I released my safety belt, cut the switch and fought the hatch cover which had momentarily jammed in its tracks.

Another quick glance told me that both wings had sheared off the ship, disappeared as if blown into smithereens by dynamite. It took 2,000 feet of precious altitude before I was able to scramble out and catapult myself into the blue. I kissed the plane goodbye as the naked fuselage plunged groundwards.

I twisted and spun as a wind five times hurricane force smacked me squarely. Plummeting earthwards, I noticed objects on the ground expanding rapidly in size, growing larger as I lost altitude. I jerked on the rip cord The chute mushroomed open, but the terrific speed at which I was traveling split it along several seams and blue sky shone through the rents in the canopy. Too late to do anything, we hit! When I came to, I was gently swinging in the harness with my feet a few inches off the ground. I had landed in a clump of small trees which had bent over, cushioning my fall . . .

THE test pilot is not a daring showman, nor is his life full of thrills like this one. His is a job that calls for cool, extremely careful and calculating effort —and a knowledge of the scientific side of aeronautical construction and engineering. He is a "guinea pig" but, unlike the animal, he must know at all times what he is doing. He gambles his skill with his life as a stake—the manufacturers gamble their airplane and a chance at a juicy contract. Either one or both can lose. I have always tried to save both.

I am a free-lancer in a business that can practically count on the fingers of one hand pilots with the ability and the inclination to risk their necks for the sake of so-called "easy money". In the last five or six years I have figured out that I have tested over 60 new types of aircraft — approximately $5,000,000 worth of airplanes! These have ranged all the way from heavy jobs down to small dive-bombers. In a moment of idle curiosity a short time ago, I estimated that I have made the dive-test sky ride close to 300 times—that dangerous, hurtling descent of from 10,000 to 12,000 feet at breakneck, terminal velocity speed.

I have never minded the drop—it's the sudden stop that counts. Falling has never hurt anyone, contrary to anything that has ever been said on the subject.

Let me take you along with me on one of my aerial jaunts, so you can see just how it feels. This one happened to be in a Grumman fighter, a model that today is performing yeoman service for the Navy. It was a trim little job to look at, and it had been checked over to within an inch of its life by company officials and mechanics. Despite such elaborate precautions, I took pains to go over every section of the plane myself. I have never met up with a single new experimental aircraft that did not have some defect in it necessary to correct—and most of the time these faults had to be found in the air.

As they load the ship with all sorts of paraphernalia—in addition to a radio set, bullets, machine guns and whatnot already installed—I hitch into my flying suit and prepare to put on my metal crash helmet. I may be a sissy,

Blood

The test pilot always sticks to his ship until he is sure he cannot save it. The wreck above is the remains of a new-type fighter that "went bad." The pilot jumped.

but I have found the best thing in the world is to put inside of it ordinary ladies' powder puffs, such as you can get in any dime store. They keep the eardrums protected so they won't be broken by the noise of the howling props.

Climbing into the cramped confines of the cockpit, I take along a note-pad and pencil, which are carefully hooked onto some out-of-the-way place. I used to wear the pad strapped down on my leg, but it caught on my safety belt once while I was trying to get out of a plane in a hurry.

Parachute adjusted comfortably, I take my baby up to about 23,000 feet in wide, easy circles. One look at the plane and at the mass of instruments before me, and I squat down low in the seat—make a wide circle to the right, notifying observers on the ground that I am ready to start. I always pick out some easily identifiable spot, such as the banks of a river to aim at inasmuch as actual sustained vertical descent is impossible, the pilot has to have some mark to "shoot at".

Now I begin to feel a little goofy for lack of oxygen for the thin air makes me feel light in the head. I check my safety belt again, lower the seat 'way down to the floor, see that the stabilizer is set right and put the propeller in high pitch. The instruments say "all's well."

Half-rolling the ship over on its back as I pull the stick all the way back, the nose goes down to an angle five degrees behind vertical. Then the stick is shoved all the way forward with the right hand—and I brace the left hand firmly against the dashboard, for support. The dive starts at about from 150 to 175 m.p.h. and the 2,000 feet are made with the engine wide open. When she hits peak roar, the throttle is closed lest the motor over-rev and fly to pieces. The altimeter spins rapidly around backwards. As I hurriedly check my instruments I note that the punishing speed of 400 m.p.h. is reached at 5,000 feet.

In the next mile after that, the plane reaches its terminal velocity of *between 500 and 600 m.p.h.!* The exact speed must be kept a secret, due to military regulations.

After about 10,000 feet, I begin the pullout. This is the dangerous part of testing. If anything is going to break or fly apart, now is the time. I look at the accelerometer that records the "G's", (7½ is what is called for this time). I want to see whether the wings or tail will come off. The number of "G's" reached on the pullout depends upon the speed the ship is traveling and how quickly you pull out.

Once done, I ease around to horizontal flight and check over the ship and controls to see that everything is all right. Then, either a landing to turn the ship over to eagerly waiting merchants and enigneers, or an ascent for another dive.

The whole works is over in less than 20 seconds. Yet, in that time, we have traveled anywhere from two to three miles almost straight down at a speed exceeding the velocity of a .45 caliber bullet from a pistol. Physically, you just *have* to be able to take it. There is that little matter of "G's", or sitting on a small seat at so many times your own weight. The pullout from the "dive" on even the most vicious roller coaster is only about 2½ G's. The average person would be knocked out by about 5 G's. Partly due to natural resistance and partly from being toughened up by years of stunt and racing flying, anything up to and around 9 G's is all in the day's work for me. I have figured it out that at 12 G's, my insides would start ripping out and that over 14 G's would be fatal.

Long dives are always made with the

(*Continued on page 66*)

Manufacturers eliminate as much guesswork as possible by pre-flight tests like this.

Many flaws (like this faulty engine mount) are detected by engineers before flights.

Below is the Grumman fighter similar to that which killed Jimmy Collins and from which the author later jumped. This ship later passed tests.

While testing a Great Lakes BG-1 dive bomber (below) once, most of the fabric of the upper wing ripped off in a dive.

FLYING WITHOUT

The author is shown above in the cockpit of the soarer in which he flew approximately 160 miles non-stop from Mount Mongola, N. Y., to Piketown, Pa., in April, 1935.

by LEWIN B. BARRINGER

Famous soaring and airplane pilot and general manager of the Soaring Society of America, Inc.

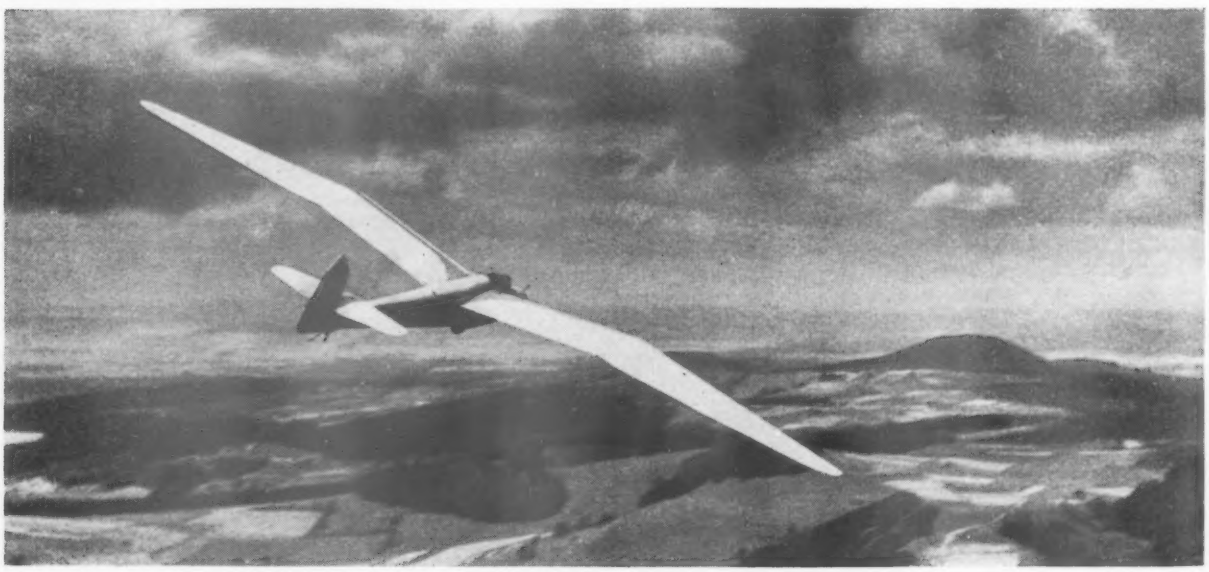
No man in the United States knows gliding and soaring like Lewin Barringer. Not long ago he proved that soaring is easily done over flat plains. In proving this he established a new distance record. Here, then, is the story of soaring by a famous airman.

RECENTLY the sport of gliding and soaring has received more public attention than ever before. Newspaper accounts of remarkable new record flights have been followed by articles in many national magazines, radio talks and newsreels of motorless flight activities. These have naturally emphasized the great appeal of soaring as a sport.

Making for self reliance, quick thinking, and healthy outdoor life, the art of gliding and soaring as a sport can be of real benefit to the youth of the world. However, this sporting angle is only part of the story, as there are several really practical advantages of importance. The principal ones fall under the headings of flight training, aircraft design and meteorology.

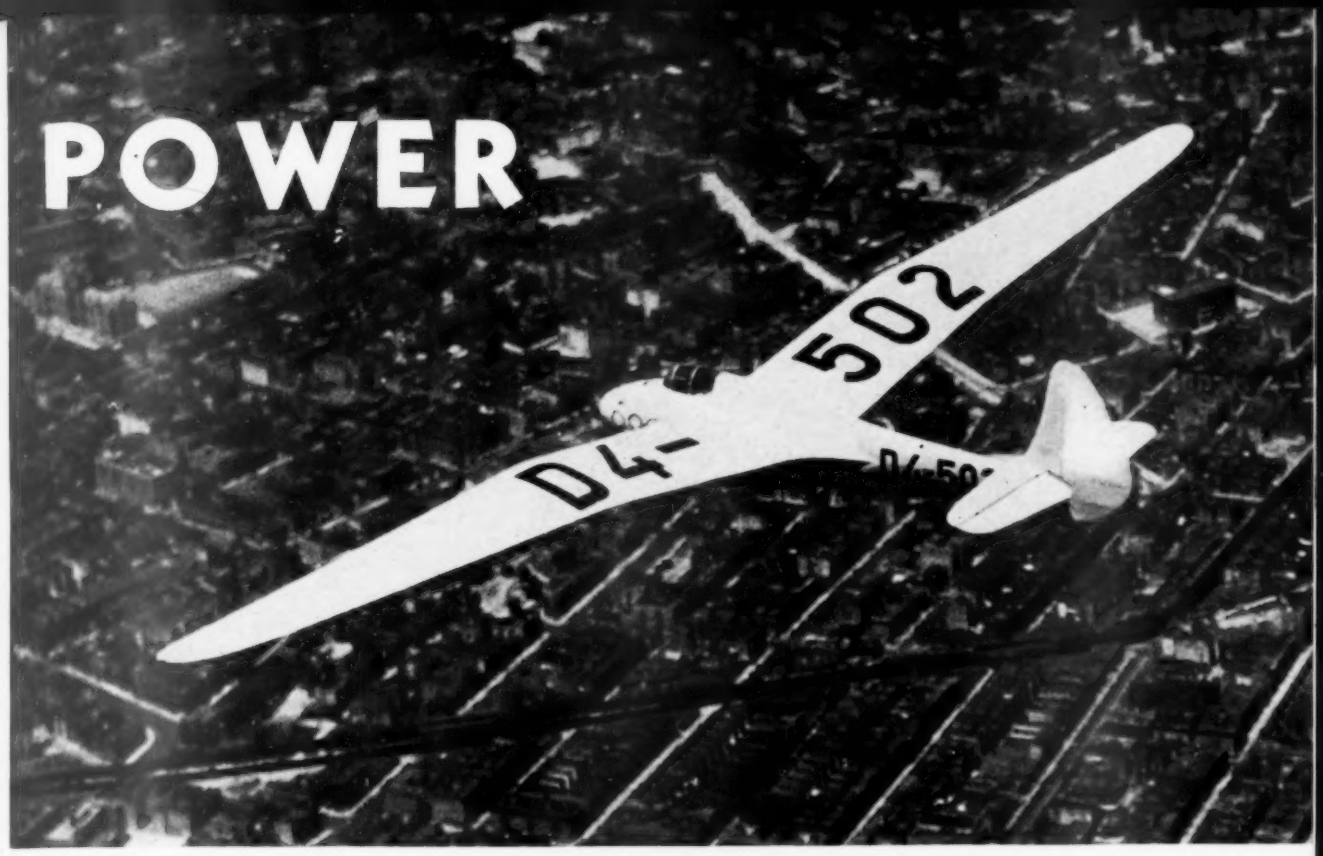
Primary gliding is the safest, most thorough—and the cheapest—way for the average fellow to get into the air. The majority of the more than 150 gliding clubs in America are groups owning primary gliders which they have bought or built for a very few hundred dollars. Learning to fly this way is largely a matter of self-teaching with the student learning the fundamentals of control on the ground or a few feet above it at low speed. Without instruments he learns to fly largely by feel and this is bound to stand him in good stead in all his future piloting.

Some years ago when I was running a gliding school, I had over 60 students who varied from a girl of 14 to a man of 60. About a quarter of these went on to become airplane pilots and, although at the time we had no intermediate



The graceful ease with which a soaring plane skims silently through the air makes it a fascinating sport.

POWER



Many a New Yorker got a shocking surprise one day in 1937 when, on looking upward, he saw this graceful man-made bird gliding noiselessly overhead. A soaring pilot was just out for a ride.

glider or light airplane and they stepped from the Waco primary glider to a 110 h.p. Waco "F", none of them took more than two hours' instruction in the "F" before soloing it. One student continued gliding for another year, then soloed an Aeronca after only 20 minutes' instruction. In each case the airplane instructors reported that those students had unusually good flying sense and judgment.

In my opinion all airplane pilots should do a certain amount of gliding and soaring in utility gliders or high performance sailplanes. I have been an airplane as well as glider pilot for more than nine years and hold the rating of Army Pilot in military flying as well as a Commercial Pilot's license with instructor's rating in civil aviation. Many times I have found that my experience of flying *without* an engine has stood me in good stead when flying a far heavier and faster aircraft *with* one.

One flight I shall never forget. In 1936 while on a two-year archeological expedition I was piloting a Jacobs-powered Waco cabin between Isfahan and our base at the ruins of Persepolis in southern Iran. The route lay over mountain ranges as high as 14,000 feet and none of the country was lower than 5,000. We had passed around two black thunderstorms which soaring experience had taught me to avoid as I know that some of these violent disturbances can wreck any aircraft that was ever built. When still 100 miles from our destination we encountered very strong head winds. The storms had cut off our retreat and it looked as if our gas could not possibly hold out.

Some miles off to one side of, and almost paralleling our course was a long mountain range. Knowing that the wind was blowing against it I flew into the rising air and saw the air speed go up 15 m.p.h. as I held the nose down to maintain the same altitude for 30 miles while cruising the engine at it most economical r.p.m. It was unmercifully rough, but I am sure that it saved the day as the gauges of both wing tanks read zero as we arrived over the field at Persepolis.

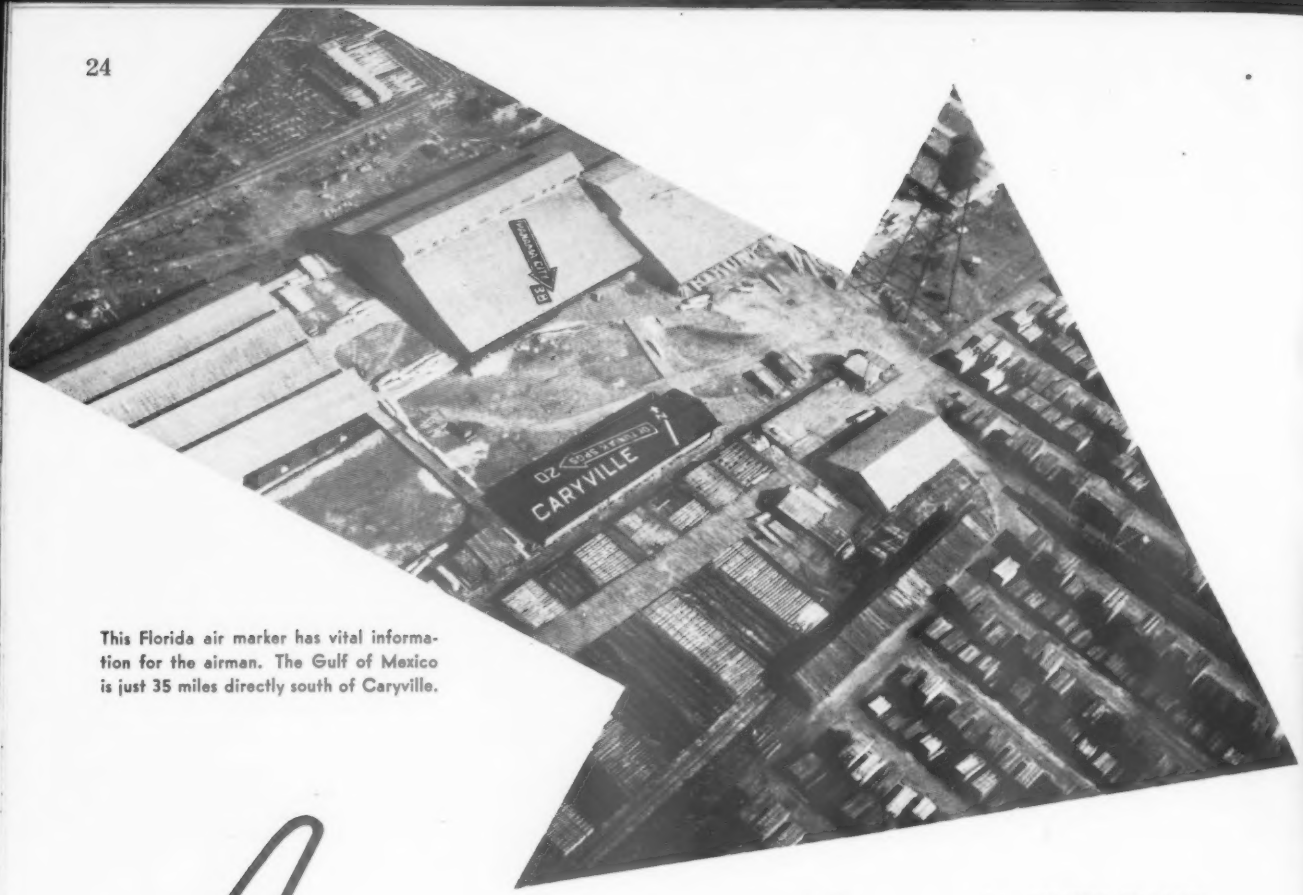
I have had a number of forced landings from engine failure which varied from a landing on a highway in the Florida Everglades to one on a rocky plateau at over 7,000 feet in Persia and yet I am happy to say that I have never cracked up an airplane. Of course luck played its part, but I can't help but feel that one reason I got away with all of them was that I had made over a thousand landings with various types of gliders and sailplanes. Every landing in a glider is a forced landing. You have nothing to lift you over the trees or the high tension lines if you misjudge so you just plain don't misjudge. This has made me approach a field with an airplane as if it had no engine whether it be a *Cub* landing at 30 or the latest Army ship putting down at better than 80 m.p.h.

In the future we should, and probably will, follow the lead of some of the European nations who require their commercial and military pilots to do a certain amount of soaring. A five-hour cross-country flight in a sailplane is of far greater value in developing skilled piloting technique than any airplane flight twice as long. These same nations also subsidize gliding and soaring as a source of potential pilots in case of military conflict.

From the viewpoint of influencing the design and construction of efficient airplanes of all categories, much can be said for the part played by the men who design sailplanes. Naturally they are interested only in building a craft which will fly at about 40 m.p.h., yet by careful designing and refinement of streamlining they are influencing the design of large airplanes flying at high speed. Recently I asked a well-known airplane designer whether he felt that sailplane building was really influencing airplane design. His answer was emphatically in the affirmative and he pointed out that the wing of one of the largest four-engined Clippers is basically the same as that on a sailplane which its designer saw while on a visit to our National Soaring Contest a few years ago. By designing to fly as efficiently as possible without any power we are finding out how to build airplanes that will fly better with less power.

Most people look on sailplanes in the light publicized by many newspaper writers who love to refer to them as "frail" and "fragile". This used to be true about some ships years ago, but the modern sailplane is far stronger than most airplanes many times its weight. While on my recent expedition to Texas I had the interesting experience of demonstrating the first sailplane ever seen in that part of the country. A number

(Continued on page 82)



This Florida air marker has vital information for the airman. The Gulf of Mexico is just 35 miles directly south of Caryville.

Airmark YOUR TOWN

by KURT RAND

Aviation sorely needs the cooperation of air-minded communities. To flyers, the air marker is a signpost and potent safeguard of incalculable value.

OLD-TIME pilots will recall—with no little distaste—the experience while "flying the iron compass" of sneaking down between the telegraph lines to catch a fleeting glimpse of the name of a railroad station, usually from a sign inconveniently placed under the eaves of the building, or of dropping down to try to decipher the weather-beaten inscription on some chimney or factory wall, in the oft-disappointed hope of getting some clue as to the name of the town. This information was often necessary for the safe and speedy completion of a cross-country flight, but the method of getting the information was, in many cases, far more hazardous than a continuation of the flight by guesswork and luck.

Air markers—signs easily read from the air giving the name of a town and other information—are not a particularly new development in aeronautical aids. There have been markers here and there for a number of years. But the sudden epidemic of markers appearing all over the country is a comparatively new development, dating back to 1935 when the Bureau of Air Commerce started its extensive air marking program. The ultimate objective of this program is the establishment of a network of air markers covering the entire United States and affording the airplane pilot the same service as is provided for the motorist by the highway signposts. To achieve fully this objective will necessitate the placing of markers in every city and town, not merely along the established airways but everywhere. For the pilot, unlike the motorist, is not bound to any set routes, but is able to make his own "highways".

Air markers may, in truth, be said to bear the same relation to flying as highway signposts bear to motoring, both as a matter of convenience and safety. In flying the safety angle is of particular importance. A motorist would have a hard time finding his way around were there no guides to set him on the right road. True, he would have his maps, but he would be forced to make many stops to ascertain his exact whereabouts so that he could locate his position on the map. Likewise the airplane pilot has his maps, and in addition his compass, but neither is of much value unless he is able to identify his ground points on the map, and can make corrections for drift on his compass course.

Few pilots today will dispute the value of air markers, not only for the sake of convenience, but also as distinct factors in the safety of flying. Cities and towns, particularly in strange territory, have an unfortunate habit of looking very much alike from the air. To see, far below, the name "Airville" standing out on some roof-top, is indeed a welcome sight.

The many navigational aids along the Federal Airways System—beacon lights, radio ranges, and radio markers—have accomplished wonders in the promotion of safety in flying. Radio receivers enabling the ships to utilize these radio aids and improved navigational instruments have made cross-country flying a far simpler proposition than it was a few years back. But it must be remembered that all the ships flying today are not equipped with radio and these modern instruments, nor is all the flying done on established airways, nor is every pilot an instrument pilot. Bill Smith, a capable pilot, likes to fly for sport and pleasure, and to make trips from his home in Airville to Airboro, neither of which is on an established airway. His airplane carries no radio and his instruments are only those necessary for safe flying. To Bill Smith, an air marker is of extreme importance. And—they will admit it themselves—the pilots flying the most elaborately equipped ships often have cause to appreciate a marker, especially when they "let down" through an overcast to continue their flight by contact.

In addition to being of value to the pilot, air markers have a definite advertising value to the town itself. Many an airplane passenger, idly gazing out of the window as the earth slips away beneath him, curiously wonders about the name of the town he is passing over.

The Bureau's part in the air marking program has been in an advisory and promotional capacity. It has not been in a position to offer funds for the actual construction of air markers, and these funds have been supplied from various other sources. The Federal Government, through its emergency agencies, such as the Works Progress Administration, has made outright grants for the placing of markers, and an important function of the Bureau is to check such W. P. A. projects and grant approval for the expenditure of Federal funds for them. Many of the states have financed air marking projects without Federal aid, especially such states as have aeronautical commissions. Civic organizations have fallen in line. Private industry, particularly the large gasoline and oil companies, have generously given large sums of money for the furtherance of air marking projects. Even the railroads, which might quite logically look on the airplane as an interloper, have cooperated in many states, though perhaps this is a protective measure to keep itinerant flyers from messing up their stations and right-of-ways.

Air marking work of the Bureau is handled by Mrs. Blanche Noyes, well-known aviatrix.

The air marking work of the Bureau is carried out by Mrs. Blanche Noyes, air marking pilot in the Airport Section. Mrs. Noyes, an experienced and well-known pilot, was appointed to this position in 1936. At that time there were four such pilots employed by the Bureau, all of whom

Close by Florida's Lake Okeechobee is the excellent air marker directly above.

Carrabelle (right center) is directly on the Gulf, has air marked its school.

Marianna, Fla., has a marker (extreme right) that shows the nearest airport.

Pinckneyville, in southern Illinois, boasts a fine air marker although it has no airport. This well laid-out marker can easily be read from almost any altitude.

The workmen above are shown putting the finishing touches on the well-known (to pilots) air marker atop a Detroit bank. Compare size of workmen with the letters.

Pekin is another air-minded Illinois community. It too lacks an airport, although Peoria is less than 10 miles north and east. Markers beside railroad tracks are best.

were women. As "sales-manager" and chief advisor of the air marking program, Mrs. Noyes has the whole United States as her territory. Her black Warner-powered Cessna is a familiar sight at airports throughout the country, for in the furtherance of the program, Mrs. Noyes has been in almost every state in the Union. She offers the Bureau's technical advice and cooperation to the states and other interests undertaking air marking programs, and stimulates public interest in the air marking program through talks and lectures at various meetings all over the country.

During her first year as an air marking pilot with the Bureau, Blanche Noyes had a striking personal demonstration of the value of the markers. In August of 1936, she and Louise Thaden (who was also an air marking pilot at that time) obtained leave of absence from the Bureau to participate in the Bendix Trophy Race. They entered—and won—this transcontinental free-for-all against strong competition, setting a new feminine east-to-west speed record and becoming the only woman ever to win this famous event. Blanche tells how, having flown for a couple of hours out of New York on top of an overcast, they dropped down underneath to make a ground check. Pretty soon they came to a large town, which they could not recognize. They continued on the same compass heading and came to another town—and they were unable to recognize that either. Finally they roared over a third town, and far below they read an air marker, "Circleville, Ohio", a town which they quickly located on their maps. They found that they were some 20 miles off-course. Inasmuch as their coast-to-coast jaunt was scheduled for only one intermediate stop—at Wichita, Kans., for fuel—they saved many valuable minutes by being able to locate themselves and get back on their proper course without straying still further from it, and perhaps eventually being forced to land and make certain of their whereabouts. Blanche Noyes gives this "Circleville" marker due credit for their winning the race. Needless to say, both girls returned to the Bureau more sold than ever on the marking program.

The promotional phase of the Bureau's work is important. When Mrs. Noyes, as sometimes happens, meets up with an official who is not "sold" on air marking, or indeed on flying itself, she has found that there is one seldom-failing way of "making the sale". She invites him to take an airplane ride with her. The chances are that this will be his first hop, and he is not too keen about the whole thing. But no man likes to admit to a woman—particularly a pretty woman—that he is scared of anything . . . so Mrs. Noyes generally gets him into her plane. The rest is easy. They take off and fly over the town, where Mrs. Noyes throttles back:

Mrs. Noyes: "This is certainly a lovely town, Mr. Jones."

Mr. Jones: "Uhh-huhh."

(*Concluded on page 74*)

The picture at left is of the flying class at Conneaut Lake in 1915. Hall is at the left. He is shown in the picture at right with the Hisso-powered Standard biplane which he still owns.

Ernest Craft Hall today.

AVIATION'S *FATHER TIME*

by M. H. CARRINGTON

Ernest Hall flew despite the advice of "experts". He since has taught many Army and Bureau of Air Commerce pilots to fly.

THEY told him he couldn't fly; but he has flown successfully for 29 years.

They told him he couldn't fly back in the pre-war exhibition days, but he taught many of the earliest exhibition flyers.

They told him so in the U. S. Army in the World War days, but he taught the Army, or at least many of its ablest pilots.

They told him so when the U. S. Bureau of Aeronautics, now the Bureau of Air Commerce, was formed, but he had taught some of the Bureau's best personnel. And he flies on and on.

Who is this ancient? Why, Ernest Craft Hall, director of aeronautics in Ohio. At the Ohio flying fields, they call Ernest Craft Hall "The Ancient Birdman" or "Father Time of Flight." Ancient Birdman, indeed! A prize example of gross understatement. Why, Ernest Craft Hall already was an ancient birdman when the current crop of pilots made all personal appearances in three-cornered suits.

Aviation, it is said, is a young man's game, but you will find the ancients' opinions valued. You will find fellows just lately graduated from knee breeches pushing around planes as experienced and established pilots, and they listen in awed silence to the men with 10 years' experience; and the 10-year men listen in veneration to the wise old men, those with 20 years' experience; and the patriarchs of 20 years listen to Ernest Craft Hall.

Hall probably is Ohio's oldest aviator in point of years of experience, and possibly even the oldest in the United States.

Not that we would have you conjure up a picture of this Methuselah of aviation as a weazened and enfeebled ancient who must be transported to his plane in a wheel chair; or as a Father Time with a long, flowing white beard. Not that, please.

He is a smallish, active, quick-moving man, in his middle 40's, growing slightly thick at the middle; with a good crop of thick, snow-white hair, and a pair of very powerful, thick spectacles, a part of his permanent equipment. The self-same spectacles, by the way, that he has worn for 30 years and which have caused folks to doubt that he can fly.

But he can fly, make no mistake! He has flown, in his 29 years, about 8,000 hours—and most of those hours in the venerable, fragile, unreliable wartime crates—without even the slightest accid - - - oh, yes, he did damage a wing tip slightly in a forced landing into a tree-studded pasture at night, long ago. Now he flies Ohio's Waco cabin biplane on state business.

Hall, a lad of 16, became interested in the science of flight in 1908 when reading of the Wright brothers' exploits, and set out to build a plane of his own. Then a dirigible exhibition troupe came to Niles, Ohio, near his home in Warren, Ohio. Hall was on hard to greet it. An inquisitive lad, he pressed close in the crowd and heard the pilot quit in a huff.

A chance, made to order. The slight, be-spectacled lad squirmed quickly between spraddled legs and around fat ladies and accosted Stanley Vaughn, the show manager.

"How about that job as pilot, mister?" demanded Hall.

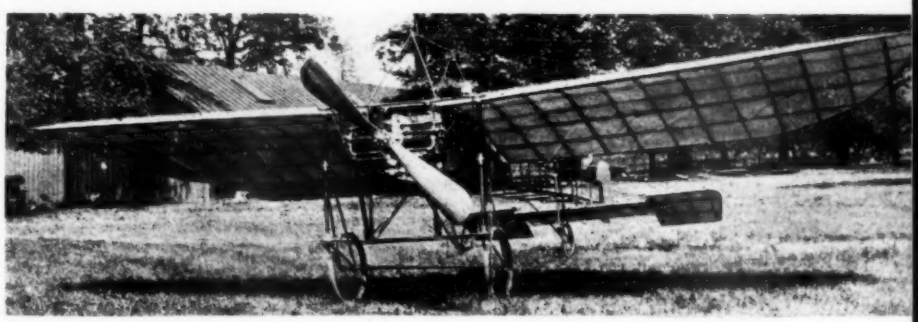
Noting the be-spectacled eyes, and slight build, Vaughn smiled paternally.

"Can you fly, son?" he inuired politely.

"Well . . . er . . . not yet, you see, but . . ." stammered the lad.

"I see," said Vaughn. "But neither could other pilots we hired. Forget it, kid. Your eyes, you know."

Hall protested volubly Finally Vaughn shrugged resignedly:



Hall's first airplane was the 1910 Bleriot monoplane (right). Note fuselage sign.

"It's your neck."

Hall accompanied the troupe as an apprentice pilot and flew the dirigible. Then the troupe bought an airplane and Hall learned to fly it the conventional way in 1909—by taxying around the field, then hopping it off the ground a few feet at a time.

In 1910 at Warren, he built his first airplane, a crude contraption of wires, canvas and bamboo. It had a lot of remarkable features and, best of all, it flew. A Bleriot-type monoplane, it was remarkably efficient. It was the first ship with the split axle type landing gear and "dep" control. With its 30-foot wingspread and 30 h.p. engine weighing 125 pounds, it weighed 400 pounds and flew 48 m.p.h. The engine was air-cooled, with two opposed cylinders, closely resembling the modern Aeronca engine.

He built additional planes, flying at exhibitions wherever a crowd could be gathered to pay 25 cents each. In 1914, Uncle Sam decided to teach many National Guardsmen to fly, and the Curtiss Exhibition Company was to get the job. Hall joined the company as an instructor at Newport News, Virginia, but the job fell through when the plan was abandoned. So Hall bought an early Wright flying boat and opened a school at Conneaut Lake, Pennsylvania, in competition with the Curtiss company.

Flying then was really a sport of the very rich, costing $90 an hour for instruction and passengers paid $15 for five minutes. But it was free and easy, no Bureau of Air Commerce, no regulations. And once you made a solo flight—what a grand and glorious feeling—you were an aviator. Now you could strut and wear leather boots and helmets, and teach students at $90 an hour.

Hall had an amusing experience in getting a student out of a jam. The student, Herman Houseman, took a few lessons, then bought a Benoist flying boat, and got a contract to fly it at Buckeye Lake, near Columbus, Ohio. It was the first plane in the vicinity and the park management made much of it, plastering Houseman's picture on signboards for miles around.

Came the day of the big flight—July 4, 1916—and Houseman hadn't learned to fly yet. So Houseman called Hall, explained his predicament and demanded:

"You got to help me out of this. I'll be ruined."

So Hall deserted his own school, and posing at Houseman, flew the plane. After the flight, a man and a woman accosted him, berating him angrily:

"You cost us $50 and a barrel of beer. We had bet you'd be killed."

In 1917, when the United States entered the World War, Hall sought to enlist in the Army Air Corps. But the recruiting officers, noting his feeble eyes, laughed, advising:

"Beat it, kid. You can't fly."

"Why not?" he demanded belligerently.

"You can't see enough," they explained, smiling paternally.

"Maybe not," he agreed angrily, "but I've been flying eight years."

(*Continued on page* 70)

Britons Smash Distance Record

This is one of the Wellesleys that recently completed the non-stop 4,300-mile flight.

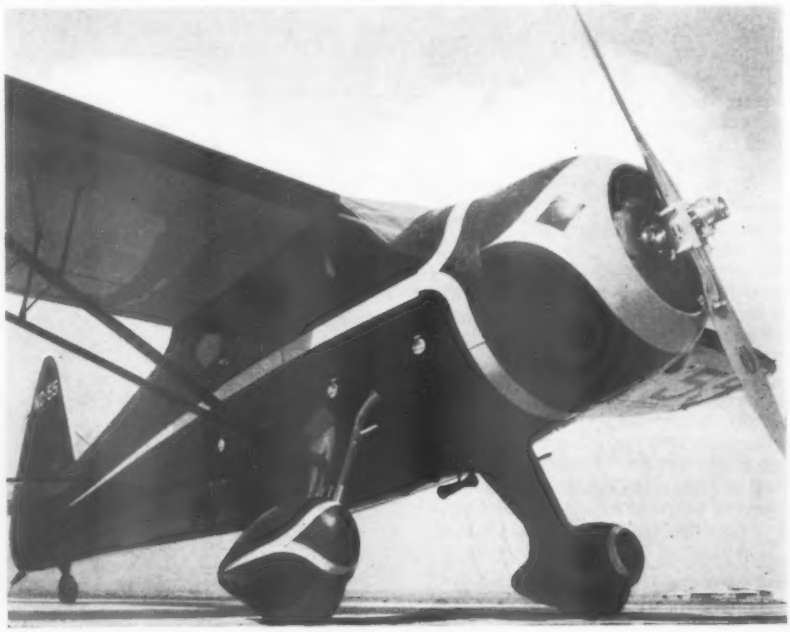
FOUR Vickers *Wellesley* single-engined long range British bombers recently set what is said to be a new world's record for non-stop formation flying. The flight, made by the Long Range unit of the Royal Air Force, was from England to Ismailia, Egypt, a distance of 4,300 miles. The flight lasted 32 hours and was made at an average ground speed of 135 m.p.h., a good pace.

The four ships were powered with Bristol *Pegasus* engines of a medium-supercharged type that were specially developed to achieve extreme economy of fuel consumption. The flight was an excellent test of these engines, for the average height at which the four ships flew was 10,000 feet.

Howards for the Bureau

BENNY HOWARD'S airplane manufacturing company in Chicago (a side line with Benny; he's regularly employed by United Air Lines) recently completed deliveries on three Howard cabin monoplanes to the Bureau of Air Commerce. The ships, for use by the Bureau's Airline Inspection Section, cost the government $49,753 ($16,584.33 each).

The Bureau Howards are powered with Jacobs engines and have a cruising speed of more than 150 m.p.h. Landing speed is rated at 48 m.p.h. Cruising range is approximately 650 miles. The striking photograph below is by N. R. Strohmeyer.



WHERE ARE THE ACES?

by JAMES FARBER

Millions of words have been written about the World War's brave fighting airmen who machine-gunned their way to immortal fame as aces. But little has been said of them today, 20 years later.

Uncle Sam's Ace of Aces, Eddie Rickenbacker, now is head of Eastern Air Lines.

EVERYONE is more or less interested in heroes. Each one of us has a little bit of hero-worship in us, even if we don't like to admit it and manage to keep it under good control.

Twenty years ago there emerged from the tragic saga of the World War a crop of heroes unparalleled in the history of the world. Many of these did not have to go unsung. There was no vast network of radio at that time to tell about their exploits, but there was a horde of eager newspaper correspondents who wrote their glory to the heavens on high.

Aviation received its crucial test, its baptism of fire in the World War and emerged vindicated and triumphant. No arm of the service created so many heroes who were individually known to the public by name as the Air Services of all nations involved in the war. This was a most natural result of the highly individual nature of aerial combat. It was closely allied to the jousts of olden times when knights fared forth to do mortal combat on the bedecked "fields of glory."

What, then, has become of this valiant tribe of men who went into the skies to find their jousting grounds? Whose lances were the deadly straight lines of flame-spurting machine guns? Whose chargers bore wings? Whose hands clasped joysticks and triggers, not reins and ponderous lances?

What are the survivors of this hard-fighting crew doing today? How do those men who qualified for the combat designation Ace feel about their experiences 20 years and more ago? Do they still fly? Do they take a keen interest in the days when they roared forth to battle in ships that are today regarded with genuine marvel?

Your reporter set about the business of ascertaining the answers to these questions and the results, obtained after a considerable period of time and involving abundant correspondence, have finally been brought together. Blame not altogether too severely, then, the bowed head of this correspondent for changes that have occurred in the present whereabouts and occupations of these World War fighters.

Major Alexander Seversky was a leading Russian ace, now heads the aircraft company bearing his name.

It is not intended that this shall be a directory of these whereabouts and occupations. Necessarily, several dozen men do not remain static over even a period of months and changes are bound to occur between the time of assembling the information and publication. But first, here are a few facts about the business of creating Aces, and some statistical background.

For the most part, the United States Army kept the best records of aerial victories. Confirmations were not easy to obtain. They were earned the "hard way" and officially reported "tallies" were very reliable. The British, on the other hand, kept no official list of aerial victories and aces were not officially recognized to the extent that American aces were. There was bitter dissention in the Royal Flying Corps on this subject because the boys in the bombing outfits resented the discrimination in favor of the pursuit units. The British did keep tallies but these were unofficial and were maintained in officers' messes.

An example of the count made by an officers' mess is that of the British Squadron No. 56, which claimed 406 victories, highest of them all. The French, using somewhat the same system, reported its Ace of Aces outfit, Spad No. 3, as having 330. This outfit, by the way, included the two immortals, Guynemer and Fonck, which is an illuminating fact. The French, in keeping their own tallies, took a broad view of things whereas the British, with punctilious regard for details, made their tallies solely on the

basis of "flamers"—enemy aircraft shot down in flames—and ships actually seen to crash. Thus, the British figures should probably be considerably higher.

Leading German combat unit was Jagdstaffel No. 11, commanded by the Baron von Richthofen, with an "official" record of about 330 victories. Richthofen himself was credited with 80 official enemy aircraft and his famous associate, who today still flies rings around many of the ablest pilots—Ernst Udet—accounted for 62 enemy aircraft.

Available data show the following concerning the number of aces: The United States had 105, of which 75 were qualified while in the American air service, 25 in the British, and five in the French. The British had about 190 aces and the French, slightly better than 200. Italy had 41, headed by Major Francesco Baracca who was shot down in flames June 18, 1918, after his 34th victory. His nearest rival for combat honors was Lieutenant Silvio Scaroni, who got through the war with 26 victories.

Belgium had eight aces headed by Captain Willy Coppens with 34 tallies. Austria's record shows five aces headed by Captain A. Brunowsky, likewise with 34 victories. Roumania reported one ace, Lieutenant B. Suk, with seven. Of Russia's three aces, headed by Captain Kosakoff, with 17 victories, two are big names in the United States today—Major Alexander de Seversky of the Seversky Aircraft Company and Captain Boris Sergievsky, famous test pilot.

By Armistice Day, the United States had trained 12,449 aviators. Training in this country cost 331 lives, and in France, 169. There were 767 pilots and 481 observers at the front. The United States lost 227 men in action, 289 planes and 48 observation balloons. Our air service claimed 781 enemy aircraft and 73 balloons.

Thus, you have a background on which to mount your mental picture, today, of what has happened to the World War aces.

Captain Eddie Rickenbacker, America's Ace of Aces, credited officially with 21 airplanes and four balloons, is today a dominating figure in American aviation. In addition to his duties as president and general manager of Eastern Air Lines, he is president of the Indianapolis Motor Speedway and chairman of the contest board of the American Automobile Association. He tells your reporter that today, "20 years afterward," he still thinks that the airplane is the Angel of Peace by uniting peoples of the world.

Captain Boris Sergievsky.

A. Roy Brown, Canadian pilot, although not officially recorded as an ace, nevertheless is an aviation celebrity too important to omit from this account since he is officially credited with having out-duelled Richthofen and shot him down. Captain Brown tells your reporter that, since he is president of General Airways, Ltd., of Canada, he spends all his time in aviation and directs operation of his company's aircraft serving the gold mining areas of Northern Canada.

Very little information is available on Colonel William A. Bishop, Great Britain's Aces of Aces, who shot down 72 enemy aircraft and engaged in 100 battles bringing him the Victoria Cross, Distinguished Service Order, Military Cross and a breastful of other awards. He is reported as being "in business in London."

Colonel George A. Vaughn is the second living ranking American Ace. Frank Luke, with 19 victories, was second until his untimely death. Colonel Vaughn chalked up 13 enemy aircraft. He is now an electrical engineer and has recently been very much interested in the establishment and expansion of New York City's airport system.

Elliott White Springs is probably today as well known as a magazine writer and novelist as he is for being America's third act, with 12 victories to his credit. Princetonian Springs wound up as a captain in the 148th Aero Squadron and after the war elected to follow a career of writing. He was eminently successful and his stories of aerial fighting are today classics. He tells your reporter, however—"I am still a member of the Air Corps Reserve. I still have a plane of my own but do not have much time to fly now, as I am devoting all of my time to the cotton textile business. I have not tried to write anything since 1930 and doubt if I will ever write anything more." The Springs cotton mills are located at Lancaster, South Carolina.

Boris Sergievsky reported that he had done much of the test flying of the supercraft manufactured by the Sikorsky company. During the war he was credited with 11 victories. In 1933, his love of adventure led him to accompany the Martin Johnsons into the heart of Africa. He further reports that he now has about 9,000 hours in the air.

James Norman Hall has been more or less of an ex-patriate for a number of years. During the late Big Fracas, he was credited, as a member of Rickenbacker's Hat-in-the-Ring Squadron, with six victories. He is the co-author, with Charles Nordhoff, of "Mutiny on the Bounty" and, earlier, "Kitchener's Mob". He served with the British and later became captain in the 103d Aero Squadron. He was captured by the Germans in May, 1918, and was kept in durance vile with the enemy until the war ended. His writing partner, Nordhoff, was a combat pilot with the French and credited with one victory. The two are now on the island of Tahiti and their serials and stories reach millions of readers, as well as movie-goers.

Reed G. Landis, son of Judge Kenesaw Mountain Landis, served on the border with the United States Cavalry then, in 1917, went to France following induction into the Royal Flying Corps as an American aviation cadet. He received British and American decorations and emerged from the war as commander of the 25th Aero Squadron, with the rank of major and with 10 officially accredited combat victories. Today Major Landis is a prominent Chicagoan. He has been identified with numerous phases of aeronautics in this country. He became a member of the Chicago Aero Commission at is inception, was an organizer of N. A. T. and T. A. T., served as special deputy coronor of Cook County charged with investigating air fatalities. He served five years and conducted 35 inquests. He was also instrumental in passing the first Illinois aviation laws.

Arthur Raymond Brooks, former Commanding Officer of the 22d Squadron and later of the crack First Pursuit Group, is today as keenly interested in aviation as he ever was when he was a scrapping pilot with six official and four unofficial victories to his credit. He has for a number of years been associated with the Bell Telephone Laboratories, Inc., of New York, and, logically enough, became head of what is probably the first "flying lab" in the world. His experienced hand guides the aviation activities of the constantly-experimental work performed by his company. He reports that when he is in Washington, the Smithsonian Institute is one of the city's main attractions for him; he goes over to look over the last Spad he flew in the war which somehow was included in the many aviation displays arranged there.

Captain John Griffith, after 21 years of flying, is still at it. He served with the Royal Flying Corps and is credited with nine victories, including two balloons. After the war he entered the U. S. Army Air Corps and now holds the grade of captain. His main interest outside of flying is his Texas ranch.

Lieutenant Jesse O. Creech, of Lexington, Kentucky, formerly of the 148th Aero Squadron, with eight victories in combat, is still tremendously interested in aviation. He was appointed Kentucky area head of the Emergency Relief Administration and although he reports that he does not do much actual flying any more, he has been the guiding influence that brought about establishment of the Lexington airport. Charles J. Biddle, of Philadelphia, who begana his flying career in the Lafayette Flying Corps with the French army, was victor in eight aerial duels and retired from the Army with the grade of major, com-

(*Concluded on page* 89)

GADGETS

YOU'D think an ordinary human being would go stark raving mad trying to keep track of all the instruments in the cockpit shown below. Especially when they all are a vital part of the sleek airplane in the photograph above as it tears through the atmosphere at more than 200 miles an hour. However, this is no particular feat for so able an airman as Major Jimmy Doolittle, the pilot in the above cockpit. The maze of instruments is in the cockpit of Doolittle's special Seversky *Executive*. As head of the aviation division of an oil company, he tours the country in this ship. If Maine today and California tomorrow is "touring."

Imperial Airways used the four-engined "Scipio" on its Mediterranean routes.

The Short "38" was built in 1912 and saw World War service. The engine was a Gnome.

"EMPIRE"

by ERWIN J. BULBAN

The Shorts earned much world-wide publicity because of the Mayo composite aircraft below. The device has proved successful and is slated for trans-Atlantic tryouts.

IT is just about two years ago that the late Sir Eric Campbell Geddes made the announcement, at the annual meeting of Imperial Airways, Limited, that 29 new type flying boats had been ordered *off the drawing boards* from Short Brothers, Limited, of Rochester. There were few in the industry that remained unmoved at this declaration and even now they will admit it was the biggest gamble ever perpetrated in British aviation.

However, while the words were still rolling off the speaker's lips in that meeting room, up at Rochester within a few short months a section head and 70 draftsmen had prepared about 12,000 drawings necessary for the ship's construction. Every little detail had to be just right, for there wasn't going to be any experimental model on which to gradually work the kinks out on. At the same time the factory was being put into mass-production shape, difficult-to-procure materials were being stocked. If the strict specification wasn't met it would mean the loss of millions.

On a cold misty morning a few months later the first one, *Canopus,* lay in the Medway with its four *Pegasus* 740 h. p. engines warming up. There was a tenseness in the air which grew as Short's chief test pilot, John Lankester Parker, glanced sharply about and opened the throttles. The giant hull parted the waves for agonizing seconds and then disappeared into the mist. Lost from view, the possible performance of their creation preyed on the waiting group. Suddenly, with a triumphant roar the machine

Air Alan Cobham used the "Valetta" for one of his first around-Africa flights. Most widely-used Short airplane today is the four-engined Empire boat below.

BUILDERS

Left to right: Horace, Oswald and Eustace Short.

First of a famous series was the "Calcutta" all-metal flying boat below.

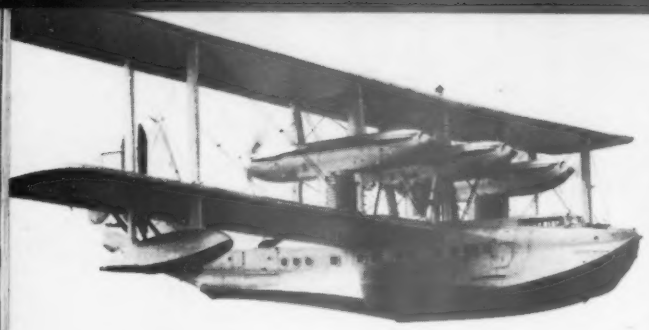
One of Britain's greatest aeronautical assets is the potent Short Brothers company. This is the "life story" of one of the world's leading aircraft manufacturers.

blasted past the works. All was well! Several of the figures were observed to light their forgotten cigarettes. *Canopus* returned to the water with a conquering air and taxied up to the mooring buoy. A few days' more trials revealed that production was assured and now Imperial Airways is proudly flying 41 *Empire* boats over the world.

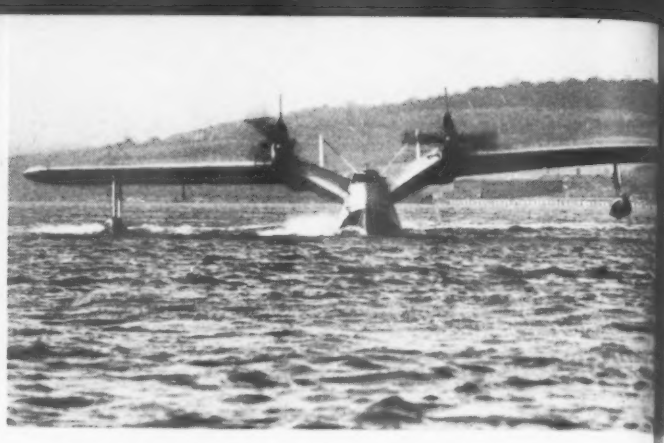
To those familiar with aircraft manufacturing it may be a source of wonder as to why a conservative organization like Imperial Airways should take such a daring step. Risking millions and two reputations in one deal. Of course there were several good reasons for such a step. One was that if they didn't contact Short while they were only moderately busy, the government would put Short to work on heavy "shadow scheme" contracts with the result that Imperial Airways might just as well forget about new equipment for another two or three years. To understand the other reason, it is necessary to retrace our steps about 39 years, to the balloon age of aviation.

The year is 1898. Headed by Oswald and Eustace Short, the company had already made itself an enviable reputation because of their fine balloon work. The tiny works was situated under some railway arches at Battersea Park Station. In 1906 their balloons won a prize for excellent construction and from then on they were the official balloon makers for the Royal Aero Club of Great Britain. However, before dust could settle on their awards, in 1907 reports came filtering through regarding the successes of the Wright brothers in America. They decided to investigate this "aeroplane" business for what it was worth when, in 1908, Wilbur Wright brought one of his early biplanes to France with the intention of competing against the best that Europe had to offer. Through

Landplane version of the "Scipio" was the "Scylla" (right) which was used in 1934.



The "Sarafrand" was a six-engined flying boat that had been designed in 1929 and was first tested in the summer of 1932.



Affectionately called "The Knuckleduster" because of its tapered full wings, the R.24/31 probably is the forerunner of a new type.

Gilbert Brewer, who had become acquainted with the Wright brothers, in America, Eustace Short was introduced to Wilbur Wright and eventually made a flight with him. It was this experience that settled the Short brothers into making airplanes. Another outcome of this was that the third and eldest Short brother, Horace—who had been busily engaged in the intricacies of building electric turbines at Newcastle and before that been occupied with being a mining engineer in Mexico—joined them. With their new determination they moved to Leysdown, on the Isle of Sheppey. It was here that Horace became the main power behind the concern.

The next year a Short airplane fitted with a Green engine and with J. T. C. Moore-Brabazon at the controls, won the *Daily Mail's* £1,000 prize for a closed-circuit flight by an all-British airplane. In 1910, Sir Francis McClean purchased the site of the present R.A.F. field at Eastchurch. Since all the planes of the Royal Aero Club were shifted there, the Shorts transferred their works again, this time putting up a substantial factory. During this time the other two brothers, Oswald and Eustace became even less active in the affairs of the concern. Among the new types produced was the first Short seaplane, tested out in Sheerness harbor, and also some two-engined biplanes which are perhaps the first multi-engined aircraft to have been built.

Three *Box Kites* were also made and it was on these machines that the first four officers appointed by the Air Ministry to the Royal Flying Corps, Naval Wing, were taught to fly by G. B. Cockburn. They were Lieutenants Samson, Gregory and Longmore, R. N., and Lieutenant Gerrard, R. M. I. L. Shortly after a Naval Air Service flying school was formed there and after the War broke out it became a naval air station. Before the latter occurred, in 1912, a Short seaplane piloted by one of their pupils, Lieutenant Samson, R. N., took off from the deck of *H. M. S. Hibernia,* it being the first time this feat had ever been accomplished by a heavier-than-air machine.

With business on the ascendant, the works were again moved, this time to the present location at Rochester on the river Medway. It was here that one of their seaplanes became the first to be successfully used in a naval engagement.

In the words of an extract from an official letter to Short Brothers, ". . . the flight made by Flight Lieutenant Rutland with Assistant Paymaster Frewin as observer, which Sir David Beatty praises so highly, was carried out in a 225 h.p. Short seaplane."

Because of the performance of these seaplanes, they were ordered by the R. N. A. S. fitted with 100 h.p. Gnome engines. Also in 1912, Short put out the "38" biplane also fitted with a Gnome and, soon after, War was declared. The "38" was one of the first types to be fitted with a gun and also with wireless. By this time, however, Short Brothers had been fascinated by the seaplane and this was their principal type throughout the War. A whole variety of them came out of Rochester in the following years. Usually they all had the same characteristics: very large wingspan bedecked with struts and wires, mounted on floats that were suspended under the fuselage, under the wings and under the tail, in fact almost anywhere where there was room enough to put them. Notwithstanding, some of these ships put up amazing service. On the side, a few flying boats for submarine reconnaissance, the *Cromarty* (two Rolls-Royce *Condors*), the F-3 (two Rolls-Royce *Eagles*) also were made from Felixstowe designs under sub-contract.

When the Shorts came out with their patented folding-wing seaplane, it revolutionized the uses of this type of aircraft by making it possible to carry large seaplanes on ships for world-wide operations. Then Flight Lieutenant C. H. K. Edmonds successfully torpedoed a Turkish transport in the Sea of Marmora with a 225 h.p. *Sunbeam*-powered Short seaplane. Today, there isn't a Naval Air Arm that isn't equipped with torpedo planes.

With all the orders that came in for their seaplanes, they found time for testing new forms of float gear. The Short brothers probably were considered queer because they actually thought there was a science to plotting these floats, when the usual procedure was to scale down the firm's rowboat and using the resulting hull shapes for float use. As a result, by the end of the War they knew a lot more about how the properly designed float was made.

Suddenly on April 6, 1917, Horace Short, the guiding spirit of the firm, died. Now Oswald Short again worked

Sir Alan Cobham also flew a "Singapore I" (below) more than 20,000 miles on another African survey flight in 1927-28.

The "Singapore III" appeared in 1934 and was little more than a cleaned-up version of the I and II. The interior was redesigned.

Tragedy struck when, on the afternoon of April 8, 1932, Eustace Short was found dead in the cockpit of the "Mussel II" (above) after landing.

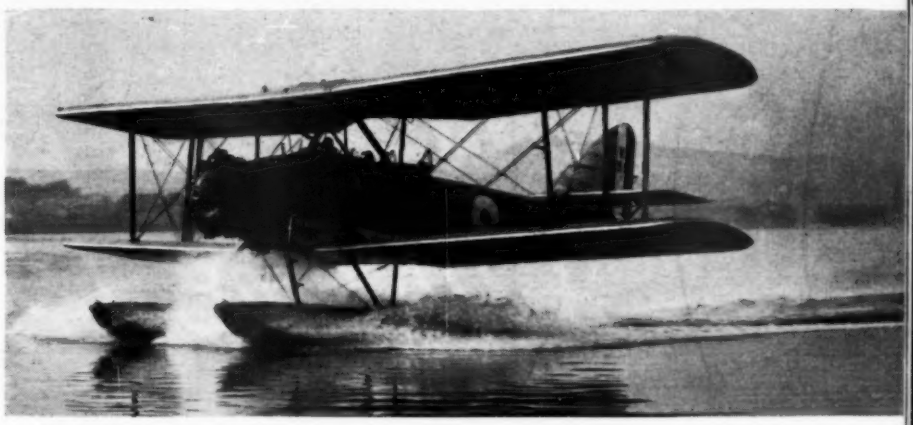
The "Springbok," built in 1925, was the first all-metal ship used by the R.A.F. This design later was renamed "Chamois."

together with Eustace and they managed the firm so successfully that when the War ended and all government contracts were cancelled, they were still able to retain all the men that they had employed during War-time production. They did this by turning to making motorboats and barges and even bus bodies.

If you will examine these industries however, you will see that the Shorts were not going far from aviation, but in fact were developing it. By designing and building watercraft, they were able to continue their seaplane-hull experiments and learn more about the mysteries of water-flow. And because the bus bodies were of metal, they became more experienced in handling this material and in its properties. At the same time they were building up a prosperous trade on the side, which they could use to back their aeronautical ventures.

It wasn't until 1923 that there was real activity at the Short Brothers' plant. Three new types were built of advanced design that showed that the time spent on bus bodies and boats was being realized. One of these was the *Shrimp*, a sport seaplane fitted with a 160 h.p. Beardmore engine. Another was the *Stellite*, a small one-place flying boat of all-metal monoplane construction. It was fitted with two Blackburn vee engines mounted on each wing and driving the propellers on extended shafts. This particular plane was built to the order of Labbaeus Herdern of Sydney. After it passed its airworthiness tests, the per-

(*Continued on page* 78)

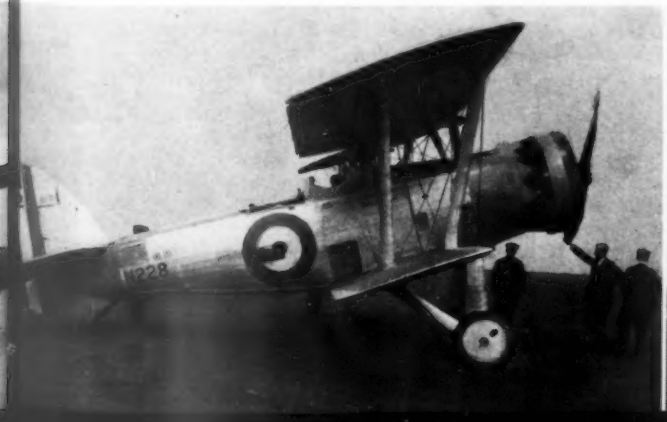


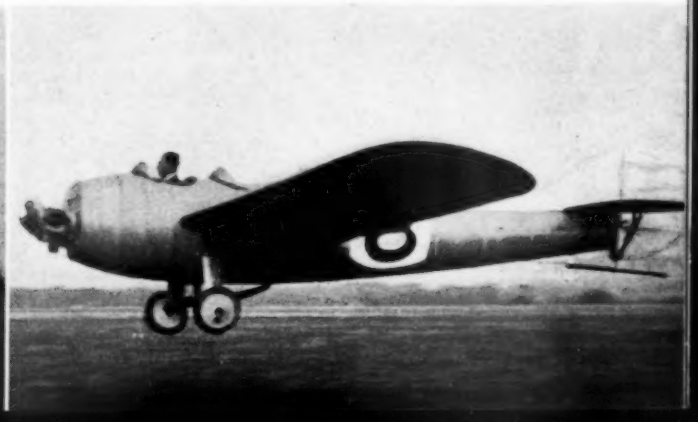
The "Mussel I" (below) was for private consumption but never became popular.

One model which failed to reach the production line was the 'Sturgeon" above.

Below is the "Gurnard" which was built both as a land plane and seaplane. This design was fitted with a Bristol "Jupiter" engine.

Here is a trim-looking lightplane that dates back to 1924. It is the "Satellite." An engine cowling was added later.





So You Want To Be An *Airline Pilot?*

It has been estimated that, if a student pilot were to buy his preliminary training for a co-pilot's job, that training would cost more than a doctor's or lawyer's.

by JAMES H. WINCHESTER

This is especially for you fellows who have airline-flying aspirations. There is more to being an airline pilot than just learning to fly. An airline man tells you all about it.

SO you want to be an airline pilot! Yes, you and some several hundred thousand others in the United States today. But by pilot I don't mean a Sunday aviator who goes out to the local airport over the week-end and takes a *Cub* or Waco up for a hop over the city. Or maybe varies that routine once a year by joining an "aerial tour" to the nearby airports in that section of the state.

No—by pilot I mean one of those men that, daily, all over the world on half a hundred scheduled airlines, take the huge multi-motored transport ships, loaded with mail, express and passengers, aloft and guide them across the heavens to their scheduled destination. Theirs is a hard job—one calling at times for instant thinking, minute understanding of the plane and its engines and at all times a sure, even and cool survey of any situation with reflexes that instantly react to any command.

To make sure that these men who fly the transport ships are of the highest calibre, we started an investigation to discover, if possible, just what steps one takes to become a transport pilot on an airline and what requirements the airlines themselves demand of these flyers whom they trust with their expensive equipment, their passengers and their invaluable good-will.

Our investigation led us to Chicago's bustling municipal airport and into the office of Captain William Lester, chief instructor of pilots for American Airlines. Captain Lester's duties cover many things, among which is the interviewing of candidates for pilot's positions with his company. In this duty during the last several years, some of the best flyers (because only the cream of the applicants ever get as far as Captain Lester's desk) in the country have stood before him, answered his keen questions and let their future careers, so to speak, rest in his hands or rather upon his "yes" or "no" as to whether or not they are to be hired.

"Before getting into the actual flying requirements that we demand of our prospective pilots," Captain Lester said, "suppose we look more or less abstractly at the picture and see what we demand of the man himself, before we will consider him as eligible for a position as a

Airline and government medical examiners do not quibble when examining airline pilots. The eye tests are especially rigid.

The medical examiner goes over each pilot with a fine-tooth comb. In addition, pilots are examined regularly every 45 days.

First Officer on our nation-wide system.

"First of all, he must have an unimpeachable character. His past life is checked thoroughly, through letters and personal interviews with past employers and others with whom he has been associated. He must have a clean record here first of all, in all his private and personal affairs. Secondly, he must be a college man.

"In the past American Airlines has hired several men who never attended college, but only because their past experience in engineering or other areonautical work more than compensated for this lack of higher education and in our minds, fitted them as capable of absorbing the fundamentals of radio and other technical information that is required today of a transport pilot. Every co-pilot we are hiring today is a college man, preferably trained in engineering.

"Third, we prefer that the flyer have his preliminary flying instruction under some recognized training group, such as the Army, Navy or an accredited flying school, rather than have gathered it in a hit-and-miss fashion; an hour here and an hour there.

"Fourth, the actual flying requirements. He must be in perfect health and able to pass a rigorous physical examination every 45 days; he must have a third class radio-telephone operator's license and he must have a pilot's instrument rating from the Department of Commerce.

"To secure the 1,000 hours of flying time, through private channels, requires a great deal of money, figuring private flying as costing approximately $10 an hour. It has been estimated that if a student pilot were to set out to buy this time his preliminary training, before he was eligible to a position as a co-pilot on a transport plane, would cost more than the preliminary training of a doctor or a lawyer.

"To obtain the third class radio-telephone operator's license it is necessary to understand the theory and fundamental practice of radio; to know the Morse code and to be able to understand it as transmitted in ground-to-plane transmission. For the pilot's instrument rating no required number of hours is set, the license being granted by the government when the complete knowledge of the subject is absorbed. This usually requires from 10 to 15 hours of instruction and flying on instruments in a hood covered cockpit of a regular plane."

If a pilot can fulfill the above listed requirements he is then set to make his application with a major airline for a

Meteorology is of vital importance to every airline pilot. The pilot and meterologist (right) are working out a flight plan.

Navigation is something airline pilots must be expert at. Below is the kit of navigation charts and calculators of a TWA pilot.

The prospective pilot is placed in the Link Trainer and for an hour and 15 minutes is put through a series of severe tests.

position as a co-pilot or First Officer. In the case of American Airlines (and all other airlines operate along similar lines), this may be done in one of two ways. The applicant may send his application direct to Victor Vernon, personnel director, at the Chicago municipal airport, or else he may apply to the chief pilot at one of American's four division points—Newark, Chicago, Fort Worth and Nashville.

In any case, the applicant is first interviewed by the chief pilot nearest his home and if the latter is sufficiently impressed with his background, his training and his flying record, he is sent to Chicago where Captain Bill Lester enters the picture for the first time.

For four hours he is given an oral examination by Lester, covering all phases of meteorology, navigation, radio, air traffic control and many other phases with which he has already assured the chief pilot, who recommended him for the interview, that he is fully acquainted.

If, after this examination, Captain Lester is sufficiently impressed, not only with his technical knowledge but with his general appearance, his personality, his academic background and general alertness during the interview, he is placed in the Link Trainer at the pilot instruction school and for an hour and 15 minutes he is put through a series of maneuvers to determine three things:

1. Whether he knows as much about instrument flying in actual practice as he apparently knows in theory.

2. To observe tendencies of relaxation, muscular co-ordination and general position and carriage while in the cockpit.

3. To observe his ability to carry out instructions as relayed to him over the Link Trainer radio system.

Airline pilots must demonstrate their prowess at instrument (blind) flying to his company's check pilot (above, right) regularly. This test too is extremely severe.

A written report of these examinations is then sent to the operations manager in Chicago and to the chief pilot of one of the four division points who recommended the applicant. If, after examining these reports, the three men—chief instructor, operations manager and chief pilot—think he is of the material that can be used on an airline, he is sent to Fort Worth, Texas, for a medical examination by Dr. Hodges McKnight, chief medical examiner for that airline.

Dr. McKnight doesn't fool around any when he is giving this initial examination. While the pilot is regularly checked on the line every 45 days by company and Department of Commerce medicos, those routine check-ups are nothing compared to the way Dr. McKnight probes into the applicant's health. He gives blood tests, a complete x-ray examination, tests eyes, ears, throat, nose and other vital organs of the body. He checks the heart and lungs and in general goes over every inch of the applicant's body with a fine tooth comb to uncover any physical defects. Once past this, the applicant can no more than draw a quick breath before he is back in the whirl again, this time on his way back to Chicago where he is taken onto the payroll as a First Officer (co-pilot) in training status.

Does he go right out then as a co-pilot flying on the scheduled runs of the system?

He does not!

His school days start all over again and for six weeks he is enrolled as a student in the airline's pilot school where he learns many things. First of all, he is taught company organization; what the various officers do, their names and their position in the company, the operating policy of the company and the general policy of the personnel. Then he is introduced to the equipment that he will fly—in the case of American Airlines, twin-motored DC-2's and DC-3's (both day-planes and sleepers).

He visits the shops, the instrument rooms, the radio transmitting rooms and the air traffic control tower atop the administration building, acquainting himself with the duties and functions of each of these units which all go into one part, making air transportation the regular scheduled operation it is today.

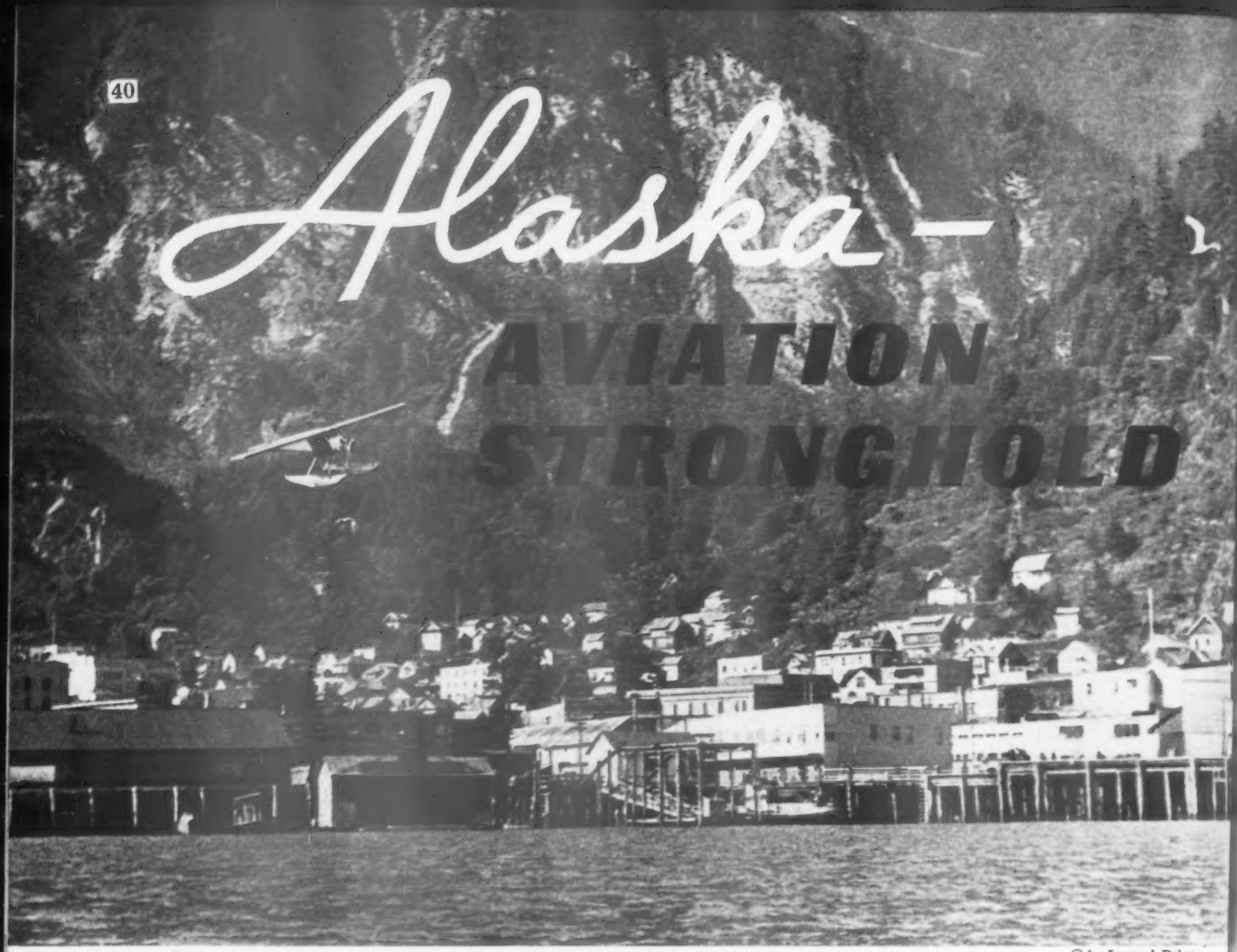
After he has established his knowledge—in theory—of the workings of the type of equipment he is to fly and the use and the necessity of the various instruments of the plane, he is taken aloft in a series of test hops with a senior pilot where, in practice, he is allowed to learn how one of the huge planes is operated. Several of these flights are made. First he must learn the proper method of lowering the wheels and retracting them and how the wing flap valves are operated. On another flight he may learn the engine and fuel mixture controls and the operation of the propeller pitch and full-feathering propeller valves. In short, on this series of six or more test hops he is allowed to put into practice what he has learned in

(Continued on page 75)

FLYING HOSTELRY

Britain calls her Armstrong Whitworth Ensign the world's largest land transport. She carries 40 passengers at 200 m.p.h.

Alaska—AVIATION STRONGHOLD



© by Leonard Delano

The striking photograph above shows a Stinson monoplane about to land in front of downtown Juneau.

by SELBY CALKINS

The Yukon is one of the most prolific users of the airplane anywhere on earth. Alaska's aviation story is a breath-taking Far North saga.

AMERICA'S last frontier, somnolent since gold rush days, is being brought to life beneath the wings of the airplane.

Picture a land which, superimposed over the United States, would reach from Canada to the Gulf of Mexico and extend west to the Pacific Coast. It would cover one-fifth of our continental landscape. Its area equals that of all our Atlantic Coast states with the state of Washington for good measure.

This land has a population less than that of Passaic, New Jersey—and ten times as much mileage in air routes as in all highways and railroads combined!

The land is Alaska, where air travel is speedily opening up new empires for industry and commerce; and where aviation is today scoring its greatest triumphs over wind, weather and isolation despite discouraging governmental indifference.

Carl Ben Eielsen, pioneer in Far North flying, took one of the first commercial airplanes into Alaska in 1922. It was only an old Jenny picked up in Seattle for a song but it served to demonstrate the practical miracle of 60 m.p.h. transportation in a country where dog team travel at 20 miles a day was good going.

He converted the Far North overnight.

Alaska has a population, exclusive of Eskimos and Indians, of about 40,000. Last year 100 Alaskan airplanes carried 19,286 passengers 2,088,418 miles—and hauled nearly 2,500,000 pounds of freight in the bargain!

"The airplane has become Alaska's *only* year 'round transportation," declares Anthony J. Dimond, delegate to the House of Representatives from the Territory of Alaska. "It has been reliably estimated that 90 per cent of the people in the Territory, when they travel more

It takes this dog team a whole day to cover the distance an airplane flies in seven minutes. This sight is becoming rare.

Sharp contrast to the dog team at left is this modern high speed Pacific Alaska Airways Lockheed. Note the ship's novel skiis.

than 200 miles travel by airplane."

When Carl Ben Eielsen and his creaking Jenny started all this, they tackled the toughest flying country yet . . . and the one that would benefit most from aerial transportation.

Alaska lies between the northern end of the Pacific, the Bering Sea and the Arctic Ocean. It extends far westward, only 60 miles across the Bering Straits from Siberia; Nome, on the Bering Sea, is farther west than Honolulu. Point Barrow, on the Arctic Ocean, is the most northerly point in United States territory.

The Territory of Alaska readily divides itself into three general sections: the south coast "Panhandle", the Interior, and Arctic Alaska. The Panhandle lies at the foot of the rugged Alaskan Range of mountains and extends from Ketchikan north and west to Juneau, Cordova, Valdez, Seward and Anchorage, ports through which the commerce of Alaska is routed. This is the Alaska of the steamship tourists, the sector of magnificent Alpine scenery, of thousands of spectacular glaciers and majestic peaks dwarfed by Mt. McKinley, highest peak in North America.

But the real Alaska, a rich territory greater in area than all our Pacific Coast states combined, is the Interior—which the airplane is opening up today just as railroads opened up our Far West half a century ago. Lying beyond the Alaskan Range and extending to the Endicott Range on the north, this area includes the storied valleys of the Yukon and Kuskokwim—mineral storehouses of unreckoned extent and wealth.

Beyond the Endicott Range lies Arctic Alaska, a little-known country of lakes and tundra where the sun never sets in summer and the earth is blanketed by the darkness of the long winter night nine months of the year.

Eielsen flew into this country with full knowledge of its obstacles: no airports, no weather forecasts or reports from far points, and no service or maintenance facilities. He was completely on his own.

On every flight he carried guns and ammunition, camping equipment, emergency rations, tools and even spare motor parts. An emergency landing meant either repairs on the spot or a long, long walk—the usual estimate was one day for every 20 minutes since the take-off!

Eielsen set a standard no pilot dares ignore. Even Pacific Alaska Airways, subsidiary of Pan American, loads its big Lockheeds with more than 500 pounds of emergency equipment—enough so that passengers and crew will be safe and comfortable for a month in the event of a forced landing in the wilderness.

Far-fetched precautions? Not at all—PAA planes cross Alaska in somewhat less than eight hours, a trek the best dog team couldn't do under 82 days. That kind of speed takes them a long way from home very quickly.

Eielsen landed on river sand bars in summer and level stretches of packed snow in winter. Since then airports have been blasted from glacial deposits, hacked out of deep forests and packed

Above is Fairbanks, Alaskan aviation center, at noon during the winter. Below is Fairbanks from the air. The city's modern airport is at the top center of the lower picture. Alaska has a total of 114 airports, 85 airplanes and 78 pilots.

Juneau's airport (below) is at the foot of the giant Mendenhall glacier. 50,000 yards of glacial gravel were blasted out for the 3,000-foot runway in the foreground.

This sky-going postman flies his star route regularly. He has landed his big Bellanca (above) beside the flagged mailbox to pick up one letter. Note the waist-deep snow.

down on filled-in marshes—at tremendous cost and without government help. Without these airports operation would be impossible in summer.

As it is, planes landing on these 'ports in the spring "break-up" season find it better to have skiis or pontoons—the mud is so deep!

Tourist folders glorify Alaska's scenery, tremendous fisheries, fabulous mineral wealth—but airmen think first, and harshly, of its weather. Along the coast temperature charts will check day for day with New York City winter and summer and zero weather is practically unknown. Rainfall, however, is so heavy that the mild temperatures are actually a handicap to year 'round air commerce.

Operators have reported snowfall so heavy as to lie a foot thick on the surface of the ocean—flakes as big as quarters falling so fast the warm sea water couldn't absorb them!

But just over the Alaskan Range, in the vast Interior, is where the flying man finds his Weather with a capital W!

Winter there starts promptly in October with freezing weather and temperatures plunging as low as 80° below zero. Nights grow longer until on the shortest day of the year, December 21, the sun is visible less than three hours. In May summer comes with the rush of ice out of the rivers. Temperatures mount, 90° above zero is common, and the days grow so long that midsummer sunrise is less than 180 minutes after sunset.

Alaskans, so help us, use alarm clocks to warn them when bedtime arrives!

Now mix this 170° temperature range with unpredictable weather, cockeyed compass readings caused by proximity to the North Pole and uncharted mineral deposits, the worst terrain in the world for flight operations, a complete lack of navigational aids and the astonishingly callous unconcern of the United States Government for Alaska's air transportation problems . . .

What do you think of the intestinal fortitude of Carl Ben Eielsen and the sourdough pilots who followed him in making Far North flying history?

There were Joe Crosson, Art Woodley, A. J. Valley, Noel Wien, Frank Pollack, Hans Mirow, Frank Dorbrandt, Harold Gillam, Harry Barnhill, Lin McGee . . . but the list is too long.

There haven't been any national honors for these men, nor do their frost-scarred old airplanes rest in any of the nation's museums. Many of the men and ships are still flying about their unheralded business—and many occupy unmarked and frozen graves in the wilderness above which they once flew.

Facing the same grim hazards as did Carl Ben Eielsen, they established air services that linked all parts of Alaska from bases at Juneau, Cordova, Valdez, Seward, Anchorage, Fairbanks and Bethel.

They were ready to take all comers anywhere, anytime—and did, with surprising regularity and freedom from mishap.

Their planes poked into Nome, Kotzebue, Deering and even Point Barrow. They carried trappers "inside" and brought them out again months later. They rushed fur buyers to remote camps and brought their purchases back in a mad race to the markets. They carried mining men on inspection trips, government officials on duty tours—and itinerant dentists on tooth-pulling expeditions!

Queer cargoes seemed to be the rule in Alaska. The sourdough pilot was never surprised at any request and Pacific Alaska's nattily uniformed crews have accepted the same philosophy . . .

One astonished operator took a trapper, his sled and *whole dog team* to a valley far in the interior. The airplane charter fee was less than the cost of food for the dogs alone, had the trapper "mushed" inside—not to mention the saving in time!

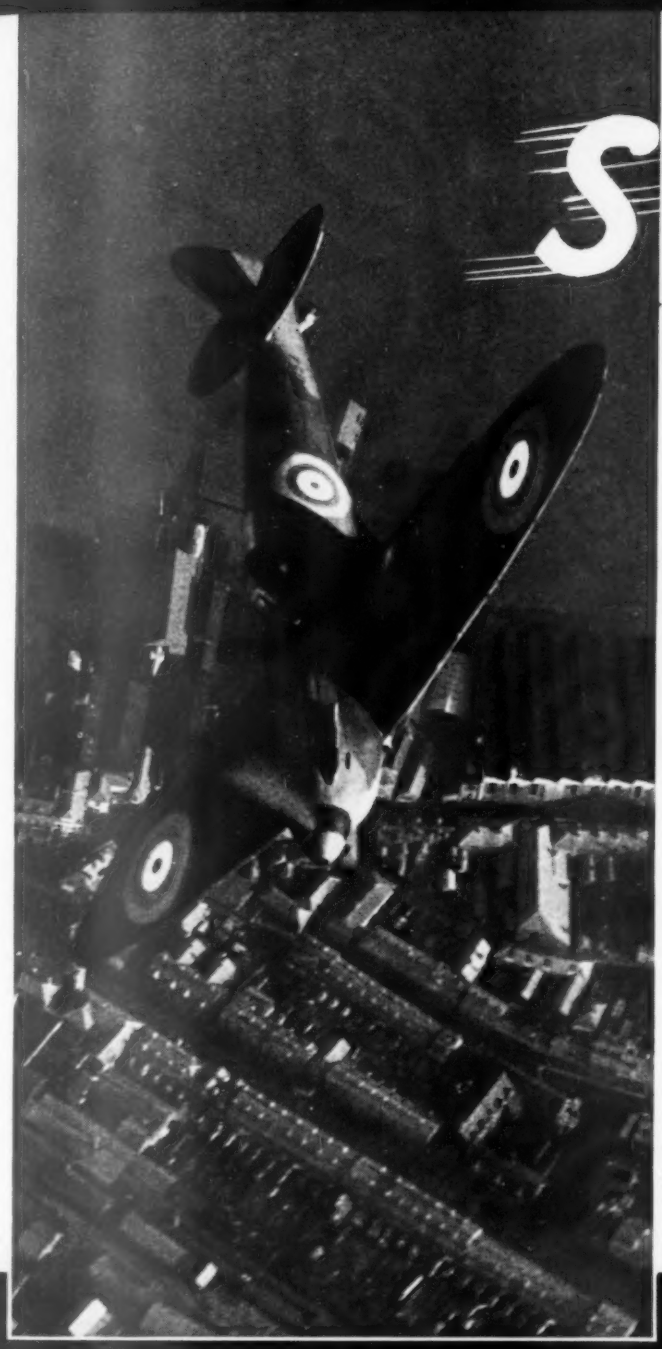
PAA claims to have had a cargo that topped all tall tales. The company's records show a Lockheed chartered last year to deliver a ton of artificial snow to a movie troupe that had come to the "frozen north" to make a film—in midsummer!

The early-day pilot, especially on a "star route" mail run, performed many other strange duties. He might land in Fairbanks, for instance, after a flight to several isolated camps, with a patch of cloth to be matched for one housewife winter-bound a hundred miles from her neighbor; an order for four dozen diapers from another preparing to face motherhood with only the aid of her husband and a native midwife; some miner's radio to be repaired—all to be taken back on the next trip out with the mail.

But what about these "star route" mail contracts? The Territory has never had a regular mail service and, with the exception of the Juneau-White Horse-Fairbanks route inaugurated by PAA on May 3 this year, still has none. In gold rush days, when dog team drivers began to shuffle mail matter over the trails in winter, they inherited the old Wild West's "star route" form of contract.

(*Continued on page 62*)

Alaskan planes must be warmed with fire pots. They must be watched carefully, though, to prevent scenes like that below.



SPITFIRE

LOUD - MOUTHED European dictatorships should look before they leap at democracy, and John Bull is giving them something to look at. The Supermarine *Spitfire* on this page is just one very high-speed glimpse of what awaits rash sword-rattlers on the European continent. Latest of Great Britain's prolific array of modern warplanes, the *Spitfire* has all the earmarks of being one of the most formidable foes in the heavens. Powered with a 1,050 h.p. Rolls-Royce *Merlin* engine, the *Spitfire's* performance naturally is a state secret. However, we have talked recently with certain American airmen who recently returned from Great Britain and who saw the *Spitfire* perform. General impressions are that the new ship is a commendable fighting plane, but does not have the performance that it seems to suggest outwardly. One prominent American pilot who made careful notes expressed surprise at the *Spitfire's* lack of agility and sparkle on take-offs and climbs—considering its high horsepower. This pilot, however, blamed this less on the airplane than he did on the Briton's persistently backward use of club-like fixed-pitch wooden propellers. Our informant also pointed out, however, that the *Spitfire* appeared sluggish because of its weight. Nevertheless, British air officials claim the *Spitfire* has a top speed "in the vicinity of six miles per minute". Basically, this airplane is a development of the famed Schneider Trophy seaplane racers of a few years ago. Contrary to any unfavorable reports on this airplane, the Royal Air Force (and its officials surely know their aviation) recently placed an order for 1,000 *Spitfires*, one of the largest aircraft orders in history. This order goes into production in a new factory with the Supermarine company, meanwhile, already having started building a large batch. Like Britain's famed Hawker *Hurricane*, the *Spitfire* will be used to re-equip existing squadrons. This particular type was designed for home defense and is technically known as an interceptor fighter. The photographs on this page were taken by a photographer for *Flight*, official British aviation magazine.

American Airlines' Lillian Fette (with Ray Milland) is a Hollywood technical adviser, stewardess besides.

An airline photographer worked fast when Kenny Baker, screen star, kissed Wifey goodbye recently (left).

Personalities

That pleased countenance belongs to Grover Whalen, New York World's Fair head. The Fair sponsored Howard Hughes' (center) world flight. Right is Al Lodwick, Hughes' aide.

Seeing Eye dogs can now fly airplanes. Morris Frank is shown here with "Buddy."

J. H. Kindelberger, North American Aviation head, sold 200 ships to England recently.

Errol Flynn recently flew United to Reno for a rumored divorce from Lili Damita.

Barney Capehart, Chicago advertising man, does air race announcing in spare time.

Mark Hellinger, famed columnist, flew 7,000 miles with Mrs. Hellinger to see Louis whip Schmeling in just two minutes.

Rudy Vallee recently chartered a United Airliner, flew the 18 members of his orchestra from New York to Chicago.

Commemorating Braniff Airways tenth anniversary, T. E. Braniff, that airline's president, was given a scroll by Moss Patterson (left), Oklahoma City air official.

Gordon Wisniewski (above) recently competed in an international model contest in Paris. Below is Dean Burleigh, engineer for Beech aircraft.

The MAN UNDER THE HOOD

SABOTAGE is an ugly word . . . But perhaps it describes the current theories about the mysterious disappearance of Pan American's *Hawaiian Clipper* . . . The story now is that one of the passengers carried something like a million dollars in currency to be delivered to the Chinese for war supplies . . . Presumably, knowledge of this was obtained by those who did not want the money delivered . . . How did they prevent it? . . . It should be easy to send an infernal machine air express, for instance . . . A time bomb set for 72 hours after the start from Alameda would do the trick . . . But **Pan American** officials telegraphed other thoughts: THAT SOLUTION IMPOSSIBLE TO SUBSTANTIATE BUT ALWAYS SEEMS TO BE SUGGESTED WHENEVER UNEXPLAINABLE ACCIDENTS OCCUR. ACTUALLY, ALL CARGO MATERIAL ABOARD PLANES INSPECTED AND CERTIFIED BEFORE LOADING AND INDIVIDUAL PASSENGER'S LUGGAGE ACCOUNTED FOR SAME MANNER . . . Maybe so . . . But it so happens that the writer has flown on **Pan American** several times in the past . . . And at no time would it have been difficult for me to have carried several ounces of nitroglycerine right with me . . . In an aspirin bottle perhaps . . . Or a "chemically automatic" bomb could easily be made up to look like a can of tomatoes or what have you . . . An official of a big chemical laboratory told me how it could be done just the other day . . . Let's get this straight . . . This is not just gossip for the sake of gossiping . . . Constructively, airlines should do something about it . . . Not being authorities on searching for explosives, we do know, though, that the **Federal Bureau of Investigation** has equipment with which it can look right through any box, package or bundle . . . Tell Mr. **Hoover** we sent you . . .

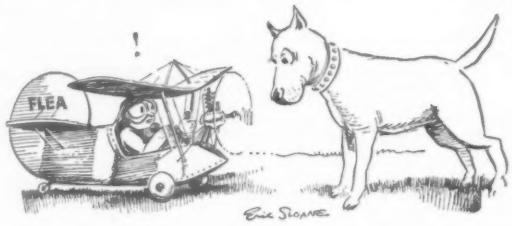
* * *

All that sounds a bit theatrical, eh? . . . Remember the Boeing 247 that **United Air Lines** lost over Dwyer, Ind.? . . . The company obtained definite proof that the tail of that machine was blown off by an exp'osion that centered in the washroom or the rear baggage compartment of the ship . . . They found razor sharp bits of metal driven through 12 thicknesses of wool blankets . . . They found the entire tail unit virtually intact and more than a mile from the main wreckage . . . Laboratory tests showed that only some explosive like TNT or nitroglycerine could have caused such a complete severance of tail from fuselage.

The Federal Bureau of Investigation of the **Department of Justice**—G-men to you—has been investigating that crash ever since it happened . . . And the investigation still is on, **J. Edgar Hoover** recently told your correspondent . . . It has progressed to the place where the Department has thick dossiers on each person aboard with whole family histories included and reports on every friend or enemy these persons were known to have . . . We might get the whole bloody story yet . . .

* * *

Some more engine information: Both **Pratt & Whitney** and **Wright** are said to be secretly developing in-line engines of high horsepower . . . That's all we know, but it's definitely an indication that the day when motors will be buried in wings is near . . . An in-line engine is more suitable than the large diameter radials for almost any installations . . . Both companies are attempting to find motor combinations that will give them extremely economical fuel consumption and low weight per horsepower.



We are told that the **Army** and **Navy** are responsible for the return of interest to the high-powered in-line engine . . . We've been told that technical experts who made trips to European countries return with stories that indicate we are falling far behind in motor production . . . The new German and English engines are supposed to be ahead of anything we have in production at this time . . . Hence the demand that the largest companies with their highly experienced staffs turn out some in-line power plants.

* * *

Here is the close to one of aviation's stormiest yet most promising stories: the **Stearman-Hammond** Aircraft Corporation has filed bankruptcy papers . . . Which marks the official end of **Dean B. Hammond's** much-cussed and discussed tricycle "$700" safety airplane . . . originally championed by the **Vidal** regime of the **Bureau of Air Commerce** as the airplane for Mr. and Mrs. Everybody, the **Stearman-Hammond** launched the return to tricycle landing gears which has since enveloped several new designs the world over, including the new huge four-engined **Douglas DC-4** . . . But **Dean Hammond** and **Lloyd Stearman** could never have hoped to continue the manufacture of their excellent machine by charging that steep price of $7,000 for each one . . . there is a possibility that the firm will attempt to reopen on a receivership basis . . .

* * *

Speaking of the **Douglas DC-4**, we've got all sorts of little items in connection with Mr. Douglas' flourishing company . . . First off, did you know that it cost $16,000 for insurance for the first hour of the **DC-4's** career off the ground? . . . Also, we hear that the **DC-5** already is under way . . . It will be an up-to-date version of the **DC-2** serving, in other words, to replace that original model . . . Here's a last-minute item: **Northwest Airlines** is said to have purchased two Douglas DC-3's from **TWA** for a reported price of $94,000 each . . . **TWA** paid a little over $100,000 per DC-3 almost a year ago . . . **Northwest** lost so much business between Chicago and the Twin Cities because of the small seating capacity of their **Lockheed** "14"s and *Electras* that they took the wise step to remedy the situation . . .the DC-3's will be used on that particular run while the "14"s will operate between Seattle and the Twin Cities . . . Incidentally, don't be surprised if the DC-4 suddenly flies from California to New York nonstop before long . . . Now there's more talk about that six-engined Douglas bomber with a 250 ft. span . . .

* * *

Lauren D. "Deak" Lyman, Pulitzer prize-winning aviation editor of the New York *Times* and lately assigned to that paper's Washington bureau, has at last gotten out from under what several of his friends insist was an "oppressive yoke" . . . He quit the *Times* recently to go with the **United Aircraft Corporation** as assistant to **Don Brown,** president . . . **"Deak" Lyman** is undoubtedly one of the very select "brains" in aviation

(*Continued on page 72*)

I WAS A FEDERAL INSPECTOR

by DONALD BUIE

The following article is, we believe, of genuine interest to private flyers throughout the nation. Let it be understood, however, that the following tells just one side of a timely aviation story. We consider ourselves justified in printing such an article by a man who once served with the Bureau of Air Commerce. We hope that, as a result of the following, we also will be afforded the opportunity to publish the "other side." Obviously, all names and places, as well as the writer's identity, have been disguised beyond recognition. The author now is actively engaged in the aviation industry.—The Editors.

We have published many instances of federal bureaucracy in the past. At no time did the Bureau of Air Commerce offer rebuttal. Herewith a former employe's experiences.

MY first contact with the Department of Commerce came when two brand new inspectors, Frank Jerome and Scotty Brigman, made their appearance one June Sunday at Morley where five or six of us itinerant flyers were carrying passengers and calmly announced they were there to give us examinations for flying licenses under the new Air Commerce Act.

Sunday was our busiest day and we were all "fit to be tied." It not only ruined our chances of making money but didn't help with the customers to have to turn them away. However, we took time out and went through the elementary maneuvers and wrote answers to the questions asked. All of us were issued letters of authority pending arrival of the regular license forms from Washington.

We needed regulation—and a lot of it—but were all impatient of restraint. After almost eight years of doing as we pleased we found it hard to accept regulation. In due time the licenses came and we breathed easier. If there was nothing more than that to regulation it wasn't half bad. We were of course, informed when the letters of authority were issued that we would have to take a physical examination at the end of six months for renewal. Even that didn't worry us. Six months seemed a long way off.

But the months have a way of rolling around and before we knew it we were notified of the expiration of the licenses and that they would be renewed by an inspector if the request for renewal was accompanied by a certified physical examination.

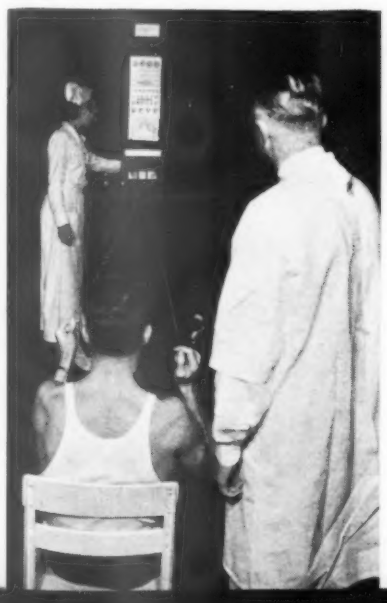
I'll never forget the look on Skid Barrett's face when he learned that the examination fee was $15.

"To H--l with 'em," he swore, took out his license and tore it to bits. "I'll not pay any $15 for a $2 physical."

Shortly before I received the notification of expiration of my license I suffered a slight injury to my right eye which was not entirely healed when I appeared at the Doctor's for examination. There was nothing fundamentally wrong with the eye and all it needed was time. This was evident and was also explained to Dr. Mason, the medical examiner. Imagine my anger and chagrin when I was notified that my license was suspended for 90 days.

I went over to Hibbing, about 80 miles away, and without mention of the previous examination took another—for another $15. This was two weeks after Dr. Mason turned me down. I passed with flying colors.

Not content I went to Major Duff, medical officer at Ft. Adams, and talked him into giving me the regular Army



Government medical examiners use the "buggy horse" method of testing depth perception.

examination for flying. He also passed me without question. I forwarded these results to Washington with some caustic comment on Dr. Mason and all his ancestors.

Weeks rolled by. I continued to fly without a license. Everybody around knew of my difficulty but I had a good record as a flyer and my not having a license at that time made no difference until two more inspectors—haughty, arrogant Bill Ayr, and Dick Leary—came and put the Pressure on everyone (and incidentally demanded that I give up my license so it could be returned to Washington).

At this time a man came along and said he had just bought a plane and wanted an instructor so I agreed to meet him—his name was Jacobs—at the Webster aircraft factory in 10 days to take delivery of his plane.

In the meantime a letter came from Washington saying that my case was being reconsidered and if I would care to go to Dr. Browne at St. Mary's and take another physical they might consider reinstatement. Another $15 and 300 miles each way. That was quite a trip in those days, besides being a piece of dilatoriness. They already had two approvals from accredited physicians and there was no reason for the long trip to St. Mary's, or so I thought, not then aware of the chicanery that was brewing.

Dr. Browne was a brusque individual who knew his business. He was an eye specialist and when he got through his examination he asked curiously, "What have you done to get the Washington office so down on you?"

I stared in amazement. "Why, I didn't even know they knew anything about me. The only thing I've ever done was to criticize Dr. Mason who turned me down at Morley," I answered.

"I thought so," he answered. "Don't you know that it is tantamount to high treason to openly criticize a Bureaucrat? To make one look foolish is to bring certain reprisal. Taking those other examinations put the Bureau in the position of having to back Dr. Mason or get rid of him. Listen to this.

"He picked up a letter from his desk and read: 'We are referring one Arthur Conley of Morley to you for re-examination. You will no doubt find him unfit for flying and agree with us that he should be permanently disqualified.' Dr. Browne threw the letter down in disgust.

"They reckoned without their host that time," he said. "I'm going to recommend a flight test. I cannot see anything wrong with you physically."

Dr. Browne refused to accept the fee I offered.

I went to Ardley with Jacobs as an outlaw pilot and trained those students. I began to wonder whether I would ever get my license back when I was called on the phone by Inspector Fouts who was at Smith's Bluff about 50 miles away from Ardley. He asked me if I

(*Continued on page* 84)

They Come in All Sizes

David and Goliath or, more accurately, the DC-4 (above) and the Phantom, Jr. (right).

AN interesting contrast in flying range is shown in the accompanying photograph. The giant ship is the new Douglas DC-4, largest airplane yet successfully flown. It has a wing span of 138 feet, is made of 65,000 pounds of streamlined metal held together with 1,300,000 rivets, and flies 2000 miles on a normal supply of 2050 gallons of gasoline for its 4600 horse-power engines.

The Phantom model airplane, powered with an Atwood engine, weighs 20 ounces, yet flies five miles on a normal gasoline supply. Could the giant transport fly as far in proportion to its weight, it would circle the earth ten times before landing to refuel.

Much of the efficiency of the midget plane results from its highly efficient motor, developed by Bill Atwood, a leader in model airplane, engine and boat design, and recent winner of American and international records at the Detroit Speed Boat Regatta. A feature of the new motor is its crankcase of die-cast magnesium alloy, lighter than aluminum. The engine has a cylinder of special alloy steel, head of die-cast magnesium alloy, one-piece steel crank-shaft, bronze sleeve-type bearings and a carburetor control that is positive at all speeds. The cylinder bore is ¾", stroke ⅝", weighs 3½ ounces, and develops 1/7 hp. at 6500 r.p.m.

Just a closeup of the Phantom, Jr.

Influence of Compression on Fuels

TODAY, the highest permissible compression ratio for aircraft engines—insofar as commercial practice and not laboratory experimental work is concerned—is 6½:1 in the case of air-cooled motors or about 7¼:1 for water-cooled motors.

The extra power and the exceptional fuel economy that may be gained by employing a high compression ratio is fully appreciated by aviation engine technicians, but thus far, engineers have endeavored to obtain detonation-proof performance of aviation engines by burning knock-proof fuel rather than by so designing the combustion chamber of the motor that detonation is averted by the very design and shape of the combustion chamber.

Just what an extremely high compression ratio can accomplish was demonstrated some years ago by the (British) Napier-Lion aviation motor nominally rated at 450 h.p. This motor fitted out with a compression ratio of 10:1, developed 950 b.h.p. with a fuel consumption of but 0.40 lb. per horse power hour at full load, and only 0.36 lb. per h.p. hour at ¾ load. This, then, means that this motor operated with the unprecedented efficiency of 39.7 percent.

True, the fuel used for the test was a very special, high priced, utterly knock-proof fuel, far from what may be termed commercial. But the fact that this fuel possessed certain undesirable qualities led to the abandonment of further tests.

But any commercial engine must burn commercial fuels. For instance, the use of blended fuel or argol-gasoline, i.e., a gasoline to which ethyl alcohol is added, is now making headway.

This blended fuel, while not at this time intended for airplane motor use, will, nevertheless, almost certainly come into general use in the not too distant future.

Agrol-gasoline is known as agrol 5, agrol 10, or agrol 15, the numbers simply indicating the quantity of alcohol added to standard gasoline of a given octane rating.

The addition of "agrol-fluid" or *spiritus frumenti* as the chemist would say, increases the effective octane rating of the gasoline so blended. The more alcohol is added the higher the effective octaine rating of the blend will be.

But since there are no un-alloyed blessings in this world, the addition of alcohol

(*Concluded on page* 64)

A remarkable historical picture is that of the crackup of one of Vaughn's balloons (right). Below is Stanley Vaughn today.

AVIATION'S *Miracle* MAN

by GEORGE R. REISS

Any one man capable of turning out aircraft with the speed and versatility of Stanley Vaughn is well worth writing about.

IF anyone might be said to be America's most prolific airplane builder, that self-same might be Stanley I. Vaughn. While others built airplanes one by one, Stanley I. Vaughn built them by the dozen; by the gross; by the thousands.

He has built all kinds of airplanes—6,000 "Jennies" alone, Curtiss pushers, flivvers, Schneider Cup racers, military pursuit and attack ships transports and what not. Even a few dirigibles for good measure. All in all, he has built approximately 10,000 airplanes in his 31 years in aviation, along with his interesting record as one of the earliest of the "Early Birds".

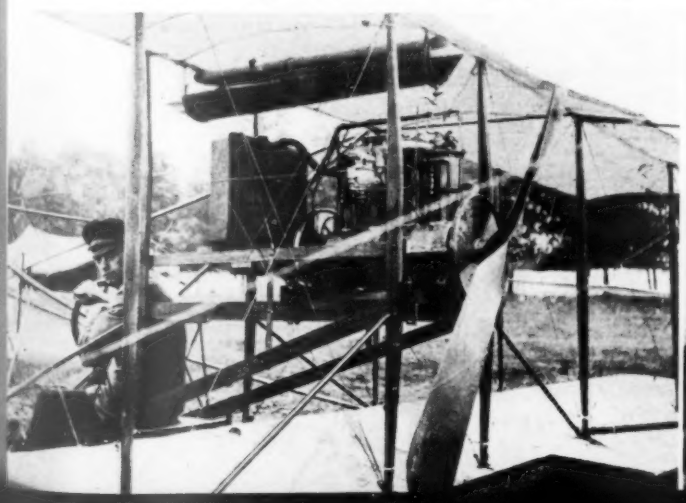
No, he didn't build them all single-handed. He had his help. He built them as factory manager for the Curtiss Aeroplane & Motor Company for 20 years and now as factory manager for the Taylor-Young Airplane Company of Alliance, Ohio, builders of the Taylorcraft plane.

An amazing chap, this fellow Vaughn, with an almost uncanny faculty for keeping abreast of the times, a rare attribute for an "Early Bird;" a fellow with rare ability for threading through the mass of minor details and cutting the red tape.

Only slightly over a year ago, the Taylor-Young company was floundering in a quagmire of disorganization which threatened to strangle it before it fairly got started. It had an excellent airplane; it had several hundred orders on its books and more coming in rapidly; it had an excellent factory and a big crew, but somehow it couldn't get the work done. It had turned out only four or five ships although the hands worked day and night. Officials tore their hair in desperation in attempting to bring order out of the chaos.

Then Vaughn was induced to resign as factory manager of the Curtiss Buffalo plant and become factory manager of the Alliance plant. In his first month, the factory turned out 15 ships; in the second month, 32 ships; in the third month, 46 ships; in the fourth, 61 ships—until the plant, under his direction, has turned

The serious looking young man at the wheel of the 1910 "flying machine" below is Stanley I. Vaughn, Esquire. This was his first "aeroplane".



Another airplane bearing the Vaughn touch was the famous Curtiss Robin, identical to Corrigan's except for the engine.

out nearly 1,000 ships to date. Besides, his old associates in the Curtiss factory presented him with a testimonial showing that under his direction 8,436 airplanes were built from 1915 to 1936. These include 320 "Jennies" built in his biggest month in 1918.

Let's look into the background of this amazing chap who has so been brought into the foreground of aviation. And a lengthy background it is, beginning almost at the beginning of aviation itself—beginning 31 years ago.

He got interested in aeronautics back in 1907 when he attended the National Balloon Races at St. Louis, Missouri. Vaughn, a 20-year-old mechanic, sent out letters offering his services to Glenn H. Curtiss at Hammondsport, N. Y., and Charles J. Strobel, at Toledo, Ohio.

Mechanics—good ones—were few and far between in those days, so Strobel indicated interest. Vaughn, with high hopes, offered to work for $50 a week and expenses.

"Not interested," Strobel wrote. So the deflated Vaughn immediately went to Toledo and persuaded Strobel to let him work for $12 a week.

Strobel, then manager of the Toledo Baseball Club, at that time was financing dirigible exhibition flights by some of the most famous flyers of that day, Lincoln Beachey, Roy Knabenshue, Charles K. Hamilton, and Frank Goodale. Vaughn was sent to Salt Lake City, Utah, as a motor mechanic with one of the Strobel exhibition companies, but he quickly blossomed forth as a full-fledged dirigible pilot.

And what a job and what a ship! A crude—and mighty dangerous—affair, one of those early dirigibles. It consisted of a Japanese silk gas bag of about 7,000 cubic feet capacity, and resembling a very fat, and exceedingly poorly made cigar. Beneath the bag was hung, by many strands of piano wire, an exceedingly skimpy wooden framework, extending nearly the full length of the gas bag. At the front end was a wood and cloth propeller, driven by a seven horsepower motorcycle engine. At the rear was a crude rudder, controlled by ropes which extended along the framework. And the framework served as the pilot's cockpit. And the pilot had need to be an aerial acrobat—for to make the ship climb, he must slide down the framework near the rudder to bring the nose up, and to descend, he had to slide forward on the framework.

For years, these ships played the county fairs, amusement parks, resorts, any place that might attract a crowd, for which the sponsors paid from $800 to $10,000 a week, depending on the size of the crowds and haggling ability of the dirigible company manager.

Although he crashed several of the dirigibles, Vaughn had his narrowest escape near Fort Wayne, Indiana. Circling the city on an exhibition flight, his motor quit, and he made a forced landing with the ship, anchoring it out while mechanics worked on the ailing motor.

(*Continued on page 76*)

Army Ace Gets Medal

Lieutenant-Colonel Olds (right) receiving his D.F.C. from Major-General Andrews.

FOR his outstanding work and leadership on the Army Air Corps recent mass flight to South America and return, Lieut.-Col. Robert Olds, commanding officer of the flight, has been awarded the Distinguished Flying Cross. He is shown at the right in the above photograph receiving the coveted decoration from Maj.-Gen. Frank M. Andrews, commandant of the GHQ Air Force. Lieutenant-Colonel Olds heads the Second Bombardment Group of that organization and is based at Langley Field, Virginia.

Lieutenant-Colonel Olds, 48 other men and seven giant four-engined Boeing B-17 *Flying Fortresses* were ordered to make the flight early in February of this year. Ten days later all preparations had been made and the flight had left the United States on its long, dangerous mission. What took place on that aeronautically historical flight was written exclusively for POPULAR AVIATION by Lieutenant-Colonel Olds himself. The complete article appeared in the August issue.

Odds and Ends in Aviation

CHILDREN under two years of age now can ride the airlines free of charge, while children between the ages of two and 12 can fly for half fare. This old railroad practice was only recently adopted by the country's major airlines and it now is in force.

The change was made as the result of a survey which showed a large number of parents who wished to take children with them on trips in the same manner as on the railroads.

* * *

AIR travel outranks motion pictures in popularity, according to a survey entitled "Industries That Satisfy" in the August issue of Fortune magazine. Quoting that survey:

"Analysis of the (survey) answers shows that air travel outranks movies in the approval of each economic level—except the Negroes—even including the poor whose chances of flying are nearly nil. Women and oldsters, still cautious of the hazards of flight, also gives the movies a slight edge upon airplanes, but very slight. And only one part of the country, Hollywood's own Pacific Coast, gives the pictures any appreciable preference—14.9 per cent as against 10.3 for air transport."

As a result of their survey, Fortune published the following table showing how the progress of the various respective industries stack up in public appraisal:

Automobiles	43.1%
Radio broadcasting	29.2
Air transport	9.8
Moving pictures	9.5
Don't know	8.4

* * *

THE biggest single order for British military aircraft yet given to any one firm was announced by Sir Kingsley

(*Continued on page 89*)

Above and left are two home-built hangars. The hangar described in the accompanying article is built in the form of a T. A flying club could arrange to tear down an old building, get the wood free.

Build a $100 Hangar

by CHARLES L. SHAFFER

This article may be the answer to your worries. This rugged one-plane hangar can be built for that surprisingly low sum.

SAM BIGONY, manager of the Bloomsburg, Pa., airport and well-known pilot and plane salesman in Pennsylvania, was giving some final advice to the four co-owners of a recently purchased Cub.

"I wouldn't fly this ship to Hyner if I were you unless you have a hangar ready for it," he admonished.

The one important thing he forgot to mention was how they should get the money to build a fireproof hangar. And fireproof it must be because the same group had stood, one day six months before and watched their plywood covered hangar burn like paper, helpless to do anything because no fire fighting facilities were available.

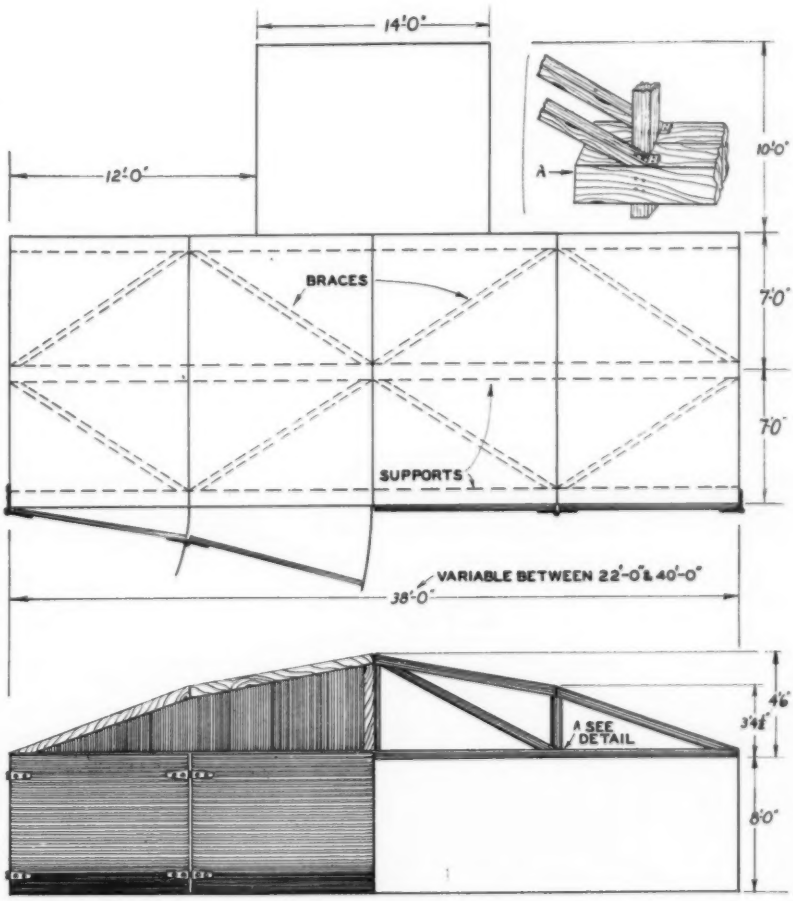
"We've got exactly $95 in cash," Harrison English, the treasurer of the outfit, said. "That won't go very far toward building a safe hangar." The others agreed and, again leaving their plane at Bloomsburg, they went home to think the situation over.

Hopes were not high for this near pauperized group that bleak March day when they returned to their homes at Renovo, Pa., to see about collecting additional funds they feared didn't exist for them. The Renovo airport, be it known, is located at Hyner, which is seven miles from town.

It was evident that none of their friends had any cash to spare even if they were interested in promoting local aviation. Those acquaintances who could make such a loan belonged to that class that wants to keep one foot on the ground and thinks everybody else should follow suit.

"Why not build as much of it as we can and then worry about the rest," one of the group suggested. And this started the $100 hangar. How did they do it? Easily. Here's the whole story and enough figures so you can go ahead today and build your own if you wish.

At the outset let me warn you that you can't play a lone hand. You've got to have some friends who will give



freely of their time and who will be glad to exchange work for some time in the air.

The hangar is built in the form of a T as shown in the accompanying diagram. It measures 38 feet across for wing room and 24 feet deep for tail. The tail of the hangar is 10x14 feet while the wing room of the hangar is 14 feet deep. At first glance, the diagram of the roof structure may scare you, but here's what you do. If you, or the members of the group do not feel capable of this carpentry work, find a carpenter friend. If necessary, you can pay him for this special work or at least the start of it until you can follow through because some leeway is allowed on that $100 just in case.

This Hyner crew was lucky because they had "Dad" English. He not only designed the hangar but supervised the job and did a great part of the work himself. Chances are, however, that you will have sufficient helpers who understand carpentry work well enough to do this part of the hangar. The rest of the job is applied common sense and can be carried on by anyone, whether he ever pounded a nail before or not.

The first official act is to stake out the corners and then dig eight post holes about three feet deep. The Hyner crew obtained eight 4x6's, twelve feet long and second-hand for $3.50. You may have to spend more or less, or again you may get a great part of your lumber for nothing. A flying club might arrange to tear down an old building for the lumber they could get out of it. A truck would be their only expense.

Now, set your posts and line them up. Try to have them vertical within an inch or your hangar will look crooked. If you're out-of-line somewhat it won't matter structurally, however. The two front posts must be notched to allow two inches of the front cross-piece to fit across them. The front cross-piece will be constructed of several lengths of 2x8's spliced at points half way between the point at which your keyed supports from the arch join. (See diagram.)

The front posts stand above the ground eight feet. The other four posts at the back are 9 feet, 8 inches high from the ground, while the two at the back of the tail are 7 feet 6 inches.

Build up the framework all around. Between each post use two 2x8's, one at top and one at the bottom. Between, two 2x4's are sufficient if spaced evenly to provide strength and also supports on which to nail the steel sheeting.

You now have not only a foundation but a scaffold to aid you in constructing the roof. Twelve-inch plank should be fitted together as shown in the diagram to form the arch from which hangs the five supports that are keyed into the cross piece. Plan the spacing of the front supports that will hang from this arch so that the cross-piece can be notched out to fit the 1¼" boards.

From the arch to the back of the wing-room, 1x8's are used and six strips are nailed across on which to nail metal roofing. The tail, which measures 10x14

(*Continued on page 77*)

Dogs to the Rescue!

Not often does the Royal Mail come to a fate like this. But when it did, not long ago, the team of huskies took up where the venerable Fokker Super-Universal quit.

THIS story is a bit unusual, mainly because everyone who has had anything to say about carrying the mail in Canada has made much of the great superiority of the airplane over the trudging, creeping dog teams that preceded the airplane. For several years, now, the airplane has replaced the dog team almost entirely.

But out of the North not long ago POPULAR AVIATION received a brief note from a correspondent in British Columbia. The above photograph accompanied the note. It is a picture that should give old-time mushers something to chuckle over. Seems the pilot was shooting a landing on rough ice when one ski snagged collapsed and threw the entire airplane belly-first onto the ice. The landing gear was washed out, as was the left wing tip and the propeller. Luckily, there was a dog team nearby. A musher unloaded the mail and the Yukon mail went through.

If Your Plane Was Stored . . .

SOME very pertinent hints on the subject of making a stored plane ready for flight have been formulated by the Aero Insurance Underwriters which have been compiled from their long experience in the field of accidents. These suggestions, be it understood, are additional to the regular routine inspection and apply to ships that have been in storage for some time.

POWER PLANT PRECAUTIONS

1. Check the cylinder walls for corrosion.
2. Disconnect and blow out fuel and oil lines.
3. Flush oil and gasoline tanks with gasoline or light oil, respectively.
4. Fuel and oil strainers checked and cleaned.
5. Carbureter checked and cleaned.
6. Inspect vents.
7. Test tank hold-down straps for security.
8. Examine insulation on ignition and other electrical wiring. Test the insulation for brittleness or for chafed spots.
9. Clean and secure the ground connections.
10. Inspect rubber vibration absorbers on engine for hardness.
11. Check propeller for security, cracks or corrosion.
12. Examine exhaust manifolds and pipe connections for rust, thin spots or cracks.
13. Examine engine cowling for loose hardware, rust or thin spots.
14. Carefully check heater for rust, thin spots, etc., and make sure that the heater passages are not clogged in any way that might cause back-pressure.

AIRPLANE STRUCTURE

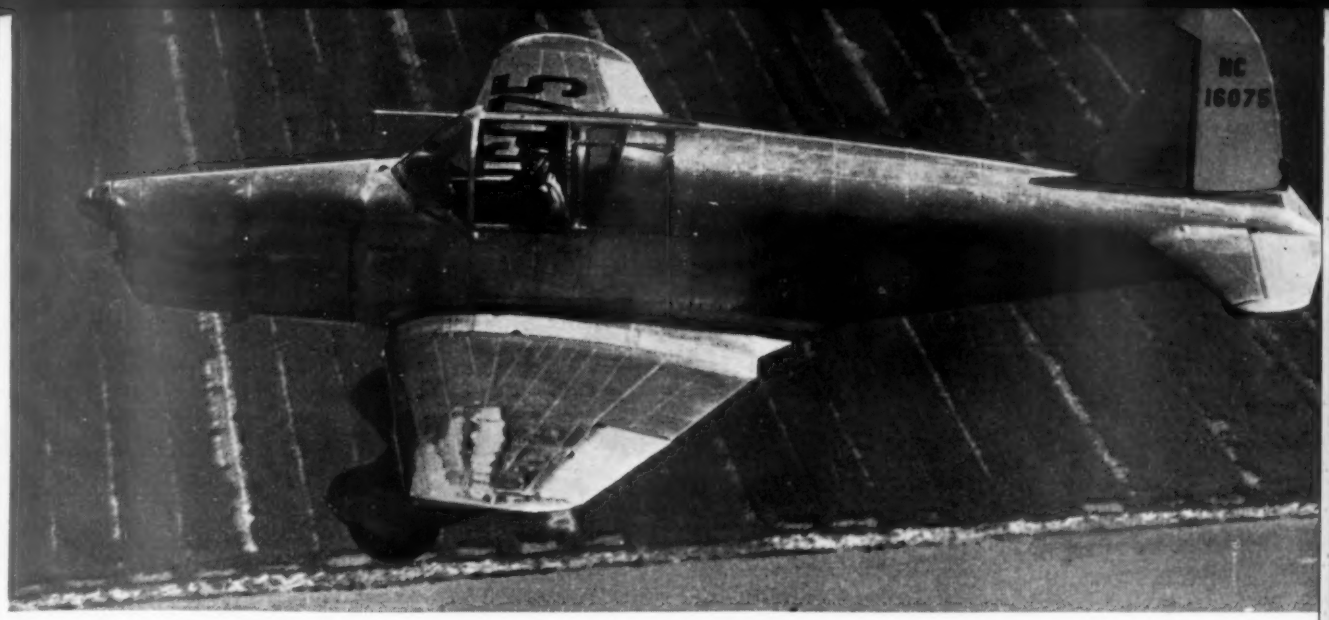
1. Open all inspection holes and examine main structural parts for rot, rust, mould or warping.
2. Shake the wings and make sure that the fittings connecting the wings with the fuselage are tight.
3. Check the fabric for dryness and for life.
4. Examine the drag-bracing inside the wings for tightness and condition of the connections.
5. Examine the inside of the fuselage structure, especially near the tail, for indications of rust or corrosion.
6. See that all rivets are tight and that none are missing.
7. Remove all dirt or debris from the interior of the fuselage.
8. Check duralumin parts for corrosion.
9. Checking landing gear for the condition of the rubber and for the amount of oil in the shock struts.
10. Test alignment and rigging of wings.
11. Examine tires for condition.
12. Calibrate the airspeedmeter and swing your compass.

CONTROL SYSTEM

1. Check control wires for fraying and rust.
2. Check tubes, pulleys and bell cranks for corrosion, rust and for stuck parts.
3. Examine covering on tail surfaces and open all inspection holes.
4. See that all parts are safetied.

AND FOR YOU . . .

1. If you have not flown the ship for some time, get a commercial pilot to check you out.



SPORTRAINER

LATEST addition to the medium-priced sport plane market is the *Aeroneer* monoplane shown on this page. According to James A. Phillips, Jr., president of the company bearing his name, the *Aeroneer* also is to be offered to the Army Air Corps as a military training ship. Mr. Phillips writes that the military version of his ship will be powered with a 165 h.p. Ranger engine instead of the standard 125 h.p. Menasco with which the sport model is powered. The Ranger-powered model is scheduled to be sent to Wright Field for tests. The Menasco-powered model, meanwhile, is an interesting private plane. Of all-metal construction throughout, the *Aeroneer* has a cantilever wing, side-by-side dual controls, glass coupe cockpit coverings, ball-bearing controls, hydraulic brakes and a steerable tail wheel. This model is said to get approximately 17 miles per gallon of fuel at a cruising speed of 138 m.p.h. at 75 per cent power at 8,000 feet. Its 43-gallon capacity gives the *Aeroneer* a range of 750 miles. Top speed, meanwhile, is 147 m.p.h. Landing speed (with flaps) is 46 m.p.h. The photograph directly below shows the *Aeroneer* beside the giant Douglas DC-4.

SHOOT "EM Yourself!

Airviews from a cabin plane are easy. Simply lower the window.

Gordon Sears Williams photographs.

If you can stand the gale in an open ship, so can your camera.

by ROY L. PEPPERBURG

Don't be hesitant about taking your camera along next time you fly. The results are well worth it.

YOU can take airviews with your usual camera and no high-priced gadgets. You can take them in the course of air travel over the countryside as well as on joy hops above your native Main Street. The world looks different from aloft. Pictures taken from the sky are in a class by themselves. They will be the envy of your friends. You will have done what (to them) appears the impossible.

As a matter of plain unvarnished fact, airviews taken under favorable conditions are about the easiest shots of any this writer has taken. All shots are taken at infinity—one need not focus. The exposure is very nearly standard according to the film and color filter used. Virtually all one need do is "aim and fire!"

All of the pictures in the series illustrating this story were taken with the popular filmpack type camera fitted with an f.4.5 lens and Compur shutter, which happens to be a 9x12 centimeter Welta. There is no reason why any hand camera should not do as well. The "standard exposure" was 1/200 second at f.11 with a K-2 filter. Panatomic film was parent to all but a few of the pictures, when Verichrome was used with only slightly less success. The absence of the yellow filter on one set of pictures appeared to cause no difference in their quality, although the day was an extremely favorable one. The pictures were taken from standard transport ships, a United States Army Martin bomber, and various Goodyear blimps.

The standard bogymen of aerial work to those who haven't tried it are haze and speed. To take the least troublesome bogy first, speed ordinarily offers no difficulty. If you stop to think a moment you will realize that even at 200 m.p.h. the earth appears to be standing still from an altitude of 2,000 feet or so. The chief job of a two-hundredth second exposure is to overcome vibration.

You have virtually no sense of motion unless you are in an open cockpit job and attempt to work by poking your head (and camera) over the side. A 200-mile gale is nothing to poke an ordinary camera into even if you can stand it yourself. Cameras for this kind of work are shielded with a metal housing and fitted with healthy hand grips on either side, when they are not built rigidly into the floor of the ship in the first place.

Nevertheless, excellent shots of a Martin bomber were taken from the after cockpit of a sister ship. The cockpit hood, rolled forward, still gave reasonable protection from the blast. From this position it was possible to shoot from either side upwards or down at a moderate angle with fair comfort.

Airviews from a passenger transport are much easier. In spite of the low-wing construction, apparently invented to prevent the taking of pictures, there is one position in most ships that affords an excellent view of the countryside. This is the door. Placed aft, it is out of range of the wing. Having no chair in front of it, one can brace himself and hold the camera close to the glass without assuming the contortions of a Hou-

The shots of the Martin bomber were taken from the after-cockpit of a sister ship. The sliding hood kept wind out.

This unusual snapshot of an airliner was taken from a smaller ship. Note the twin shadows of both planes on the clouds directly below.

dini. The safety glass used in planes is clear, the windows are usually clean, and everything considered, the door is an excellent spot from which to shoot.

Now and then transport pilots leave the cockpit door open. This is the time for some interesting shots framed by the windows of the pilot's compartment, and possibly the heads of the pilots. The window frames, pilots, controls and assorted gadgets will not be sharp unless you ignore the view beyond. This need not trouble you. These details will print in silhouette in any event, will be clear enough to be recognizable, and offer a departure from the orthodox airview.

A well-known war correspondent in Manchukuo proved that pictures can be made from yet another and slightly esoteric post in many ships. During Japanese operations he found himself flying above the Great Wall of China in a cabin job of slightly ancient vintage. Surrounded by windows of an isinglass-like substance of dirty yellow, he looked about for some place to let go his camera. The only opening in the ship proved to be the water-closet—a decided misnomer since it was one of the open bottom type found in some railroad cars. The correspondent took his pictures of the Great Wall of China through the porthole-like vent of the water-closet!

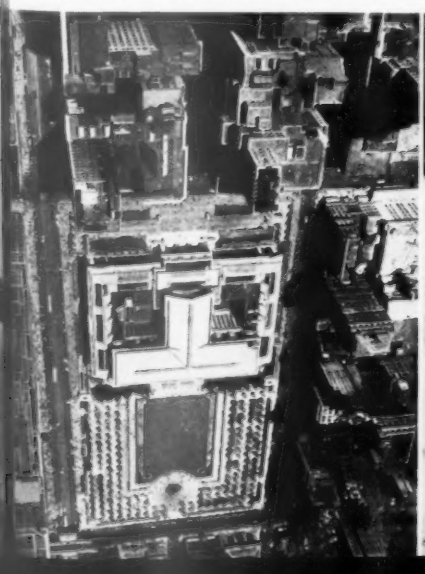
For the greatest possible ease and comfort in the snapping of airviews no plane can compare with the possibilities for nice work from the Goodyear blimps used for sightseeing above our principal cities. In flights lasting 20 or 30 minutes they float over the downtown sections of their various cities at an altitude of about 1,400 feet. Planes over similar areas usually must fly above the 2,000-foot level. At the normal indicated air-speed of 40 m.p.h., the helium-filled bag seems suspended in space.

From 1,400 feet on any reasonably clear day there is no more haze than on the ground. The gondola seats about six passengers in roomy chairs, and the windows may be opened without danger of being carried away by the propeller blast. You can comfortably lean over the side to shoot down. Since the twin motors

Airline pilots are notoriously rabid on the subject of photography. A large number of them always carry a camera. A United Air Lines co-pilot shot the above picture.

Low flying demands a little more exacting work on the part of the aerial photographer. The above Abrams Aerial Survey picture shows how ably the air-camera records views.

For the greatest possible ease and comfort in the snapping of airviews, no plane can compare with a sightseeing balloon. Manhattan is seen below through a blimp's window.



Can you figure this one out? It's an unusual air shot of New York—upside down!

are aft, you have a clear view to either side and ahead. The blimp is very nearly ideal for amateur airviews. One each of these ships is stationed in Washington, D. C., Hollywood, Miami, and New York, ordinarily. Very likely they can be found elsewhere. They are born and bred in Akron, Ohio.

A passing reference to haze, our second bogy, slipped into the song in praise of blimps a moment ago. Below 1,500 or 2,000 feet haze generally offers no particular trouble. Now, planes prefer to fly above 5,000 feet. The trend is ever higher, with the day of stratosphere ships not far distant. Exceptions happen. This writer once flew from New York to Washington at about 3,000 feet. Such things still happen now and then, when wind and visibility are most favorable at low altitudes.

Twice in every flight, however, the plane flies low—at the take-off and in landing. Here is a chance for comparatively close camera work at a time when the ground beneath is most interesting, with the limitation that you are apt to be politely requested to take your seat and buckle the gadget euphemistically called a seat-belt during the actual take-off and landing. With eyes and camera glued to the window you can postpone this detail until actual contact is close at hand—and meanwhile trip the shutter several times.

Another word for low-altitude work before soaring into the blue—the benefits of comparatively slight haze only apply to shots taken more or less directly downwards—say 45 degrees or steeper. Obviously distance is distance, haze in proportion, whether the distance is vertical or horizontal. When you attempt comparatively horizontal shots bringing the horizon into view, even at 2,000 feet or so the haze builds up.

The yellow filter, such as the K-2 already mentioned, is a help here. Others called aero filters are sold for this work. They are slightly paler than the K-2 and have a greenish cast. Generally panchromatic film and K-2 will pick up just about what you can see with your eye. For extreme distance infra-red and the Red "A" filters have been used on fast lenses and panchromatic film with astonishing results.

Pictorially speaking, when the world drops 7,000 feet or more below, the camera can be turned to greatest advantage on subjects nearer at hand—on the billowy upper side of clouds if you are fortunate enough to be flying above them, and stray mountain peaks when there are towering Olympus's in the neighborhood. General exposure treatment of these subjects is not greatly unlike shooting the earth from lower altitudes.

The brilliance of snow-clad peaks and glistening cloudbanks in sunlight should be treated with the respect one accords snow and white sandy beaches wherever found—shut down a couple of stops to allow for the glare. A sunshade is a great help—indeed, it is practically a working necessity in all aerial work, but that would naturally follow with sun-

(*Continued on page 70*)

1897 Frank Hawks 1938

FRANK MONROE HAWKS turned in his wings on August 23 after 21 years of flying. Fittingly, Frank Hawks died in the midst of a lifelong effort to make aviation safer. From facts we have hurriedly gathered at press time, the accident can hardly be blamed on anyone specifically; statisticians call it an "act of God". Flying a Gwinn *Aircar,* Hawks (he was carrying one passenger who also was killed) flew into a group of treacherously invisible power and telephone wires. The plane crashed and burned.

Thus ends the life of another of aviation's godfathers. Frank Hawks flew everything from gliders to racers. About a year ago he took an interest in Joseph Marr Gwinn's safety plane. Even at his death Frank Monroe Hawks was working to advance safety in the air.

High Speed Ambulance

THE large crowds which assembled at Floyd Bennett airport, New York, to witness the arrival of Howard Hughes from his record flight noticed a plane land of similar design to the one flown by the round-the-world flyers.

Excitement quickly spread through the crowds and word was passed around that it was a twin-motored Beechcraft which had just flown 1,800 miles from Sheridan, Wyoming, in 10 hours and 40 minutes flying time, stops having been made at Omaha, Chicago and Cleveland.

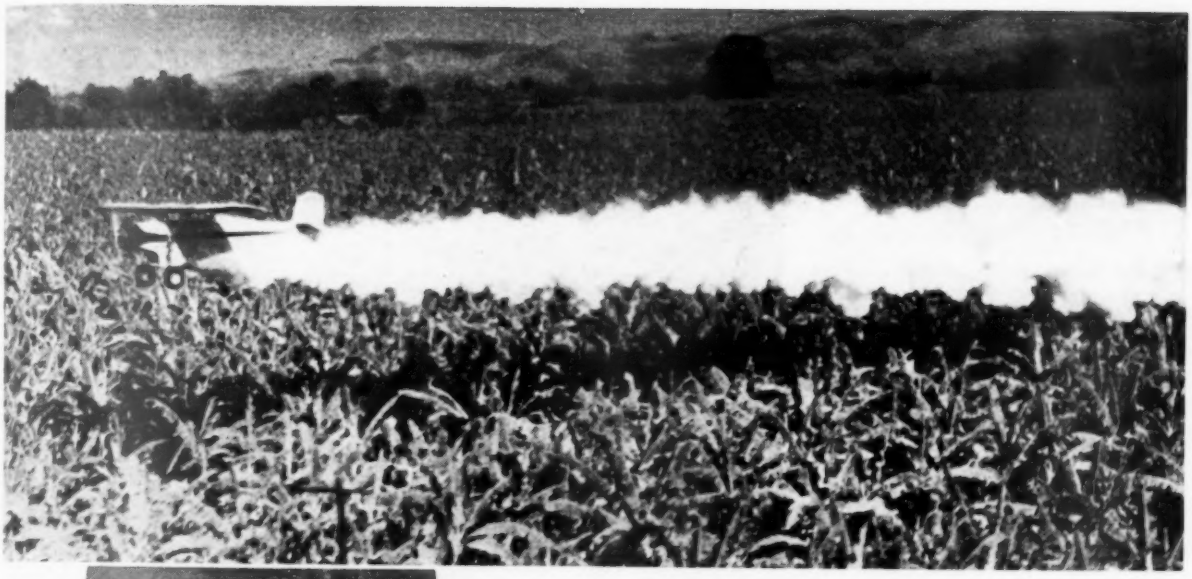
The plane taxied up to a hangar where it was met by an ambulance. A patient in critical condition was taken from the plane on a stretcher and placed aboard the ambulance.

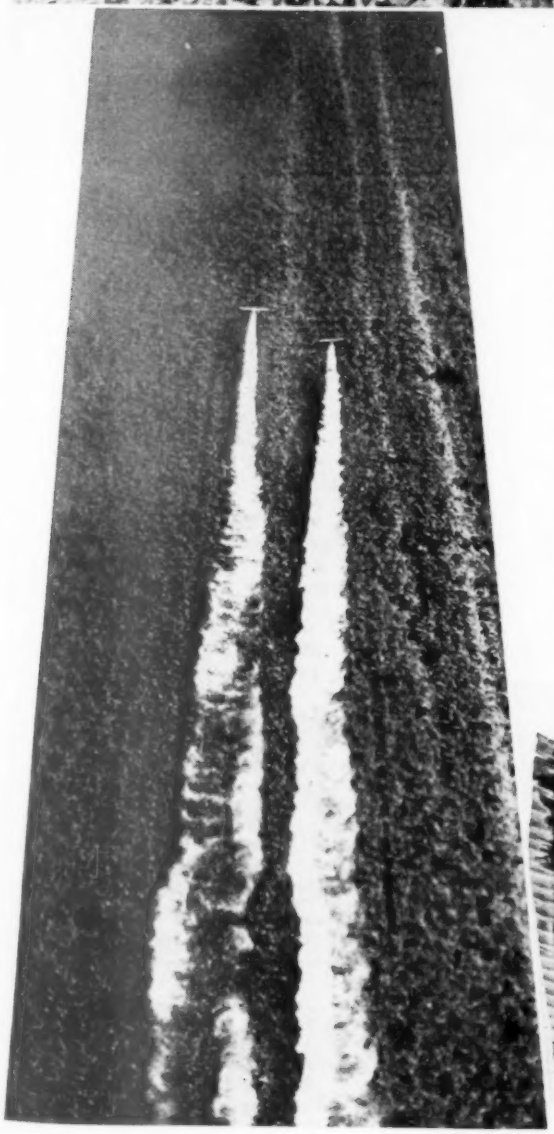
Only 42 hours before, Orrin J. Whitney, president of O. J. Whitney, Inc., a New York flying service, was in his office at Rockefeller Plaza when he received a telephone call from Dr. Harry Koster, a prominent Brooklyn physician. Dr. Koster was desirous of obtaining an airplane to bring to New York his assistant, Dr. Arthur Shapiro, and Mrs. Shapiro, who were victims of a serious automobile accident, a head-on collision near Sheridan, Wyoming. The patients in their serious condition had to be moved quickly and carefully and only on stretchers.

Upon Mr. Whitney's orders the company's new twin-motored Beechcraft was transformed to an air ambulance. This ship was selected because of its 190 m.p.h. cruising speed and its ability to accommodate two stretcher patients with ease. J. H. Lymburner, pilot for Lincoln Ellsworth the explorer, went as co-pilot. A nurse was taken to care for the patients during the flight.

After a journey involving 11 hours and 35 minutes flying time, the plane arrived in Sheridan. A stop of eight hours was necessary in Chicago for change in weather. After one more stop at Sioux City the ship arrived in Sheridan. Mr. Whitney announced that he was prepared to take off immediately and the patients were rushed to the airport and placed aboard the plane.

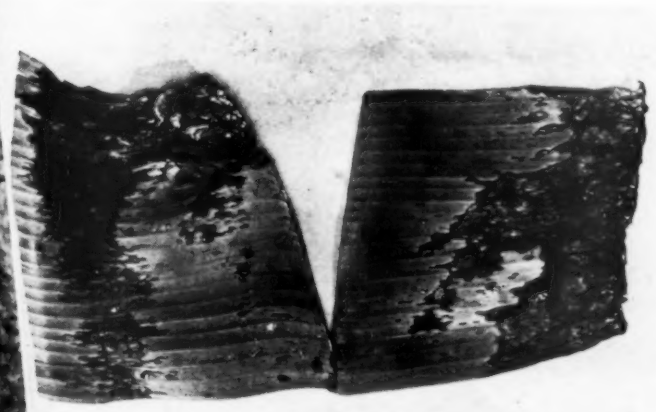
During the flight from Sheridan, Dr. Shapiro's condition changed and after arrival at Omaha the nurse advised that the patient be removed to a hospital. This was done and Mrs. Shapiro, remaining on the plane, continued the journey to New York.





SKY DUST

THE airplanes on this page are fighting a war—but not against humans. The enemy, however, is as deadly to plant life as anything any human could conceive. This killer (one of his deeds is illustrated directly below on two banana leaves) has been in existence for many years and, until comparatively recently, has gone about his crimes unhampered. As a result, millions of dollars worth of valuable crops have been totally wiped out. The airplane, however, has changed that picture drastically. Airplanes have proved themselves admirably capable of waging widespread war on plant lice, weevils and worms. So well could the airplane do its work that there are several companies throughout the world that devote their entire time to "sky dusting." The airplanes (of American make) in the photographs directly above and at left are in regular use in Central America. Usually, the pilots are Americans. The photographs shown here, as a matter of fact, were brought to POPULAR AVIATION by Joe James, old-time airman, who recently returned from Honduras. He had been dusting banana crops under contract for a large American fruit company. According to James, standard American single-engined monoplanes with good weight-carrying capacity are sought for that work. Then the "dusters" and their mechanics convert the ship to fill their specialized dusting requirements.



A Rubber-Powered Pursuit

by PAUL W. LINDBERG
Model Editor and Designer

DUE to the many requests for a rubber-powered model, we have designed a snappy little pursuit that can be built up in a very short time. Its construction is so simple that the most inexperienced builder will have very little difficulty in constructing it. This model was primarily designed so that you might build it during your vacation and so that you will have many enjoyable hours flying it this summer. As you will note on the plans, a rubber motor is cleverly concealed within a paper tube which will withstand the severest strain. The plans are full-sized so that you might work directly from them. Use ordinary waxed paper over the plans to prevent parts from sticking to them while being worked on.

Construction of Fuselage

The tubular part of fuselage is made of ordinary drawing paper such as used in drafting courses. The paper should be an oblong piece rolled into a tube as shown on the detail of plan. After the proper shape is obtained, slip rubber bands at three different points along the tube. Apply cement along the spiral seam and let dry. Next trim off either end so as to fit in the nose and tail blocks.

From a 3/16" thick piece of soft balsa, cut the lower part of profile fuselage. This is attached to the tubular piece with the addition of small braces on either side.

The tubular part of the fuselage is made of ordinary drawing paper such as is used in drafting courses. The rubber motor is cleverly concealed within this rugged tube.

Construction of Landing Gear

From .032 piano wire, bend one left and one right landing gear. As you will note, each side is made from one continuous piece, being bound at the bottom with thread. Holes in the fuselage may be either drilled or burned through. With a needle and thread, bind the landing gear struts securely to fuselage. After this has been accomplished, a liberal amount of cement is applied over the thread and landing gear wire. The tail skid is an ordinary piece of piano wire inserted into the rear of fuselage.

Construction of Wing

The ribs are cut from 1/16" thick (or less) balsa. Next cut and sand the leading and trailing edges to their proper shape. The leading edge and spar are tapered, so a little added work is required in order that they may be held to a true curve. The wing tip is made from 1/16" sheet balsa braces with two 1/16" square diagonal braces, as shown on top view of right wing panel. Please note that ribs "A" in either wing panel are cemented on an angle so that the dihedral is automaticallly built in. Front and rear wing supports are attached to wing after it has first been covered with tissue.

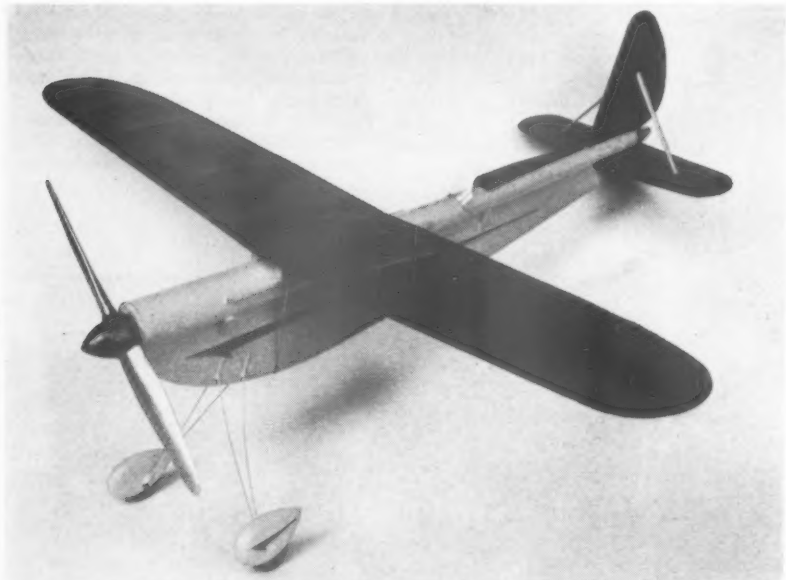
Construction of Elevator and Rudder

Construct these from 1/16" square balsa and sheet wood, upon a flat surface, using pins to hold the framework together in order that the cement will have a chance to dry. These are attached to rear of fuselage after they have first been covered with tissue.

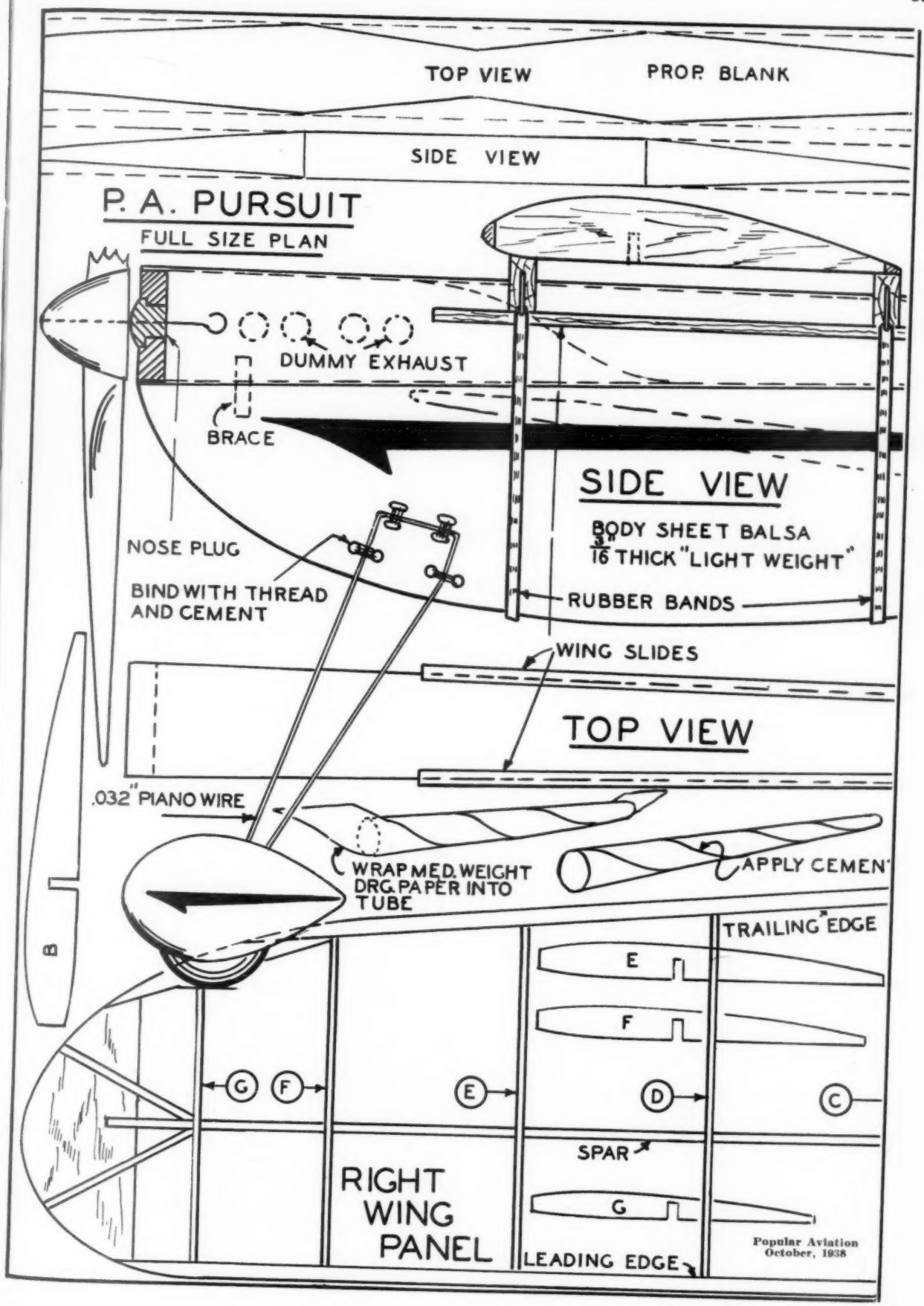
Covering the Model

In covering the wings and tail surfaces, cover only a section at a time. For instance, from the top of the wing panel from rib "A" to the tip, top side only. Use a light grade of model airplane dope in fastening tissue to framework. The bottom side of wing panel is covered in very much the same manner. Stretch the paper in order to remove as many wrinkles as possible with-

(*Continued on page* 75)



This model was primarily designed so as to be built during summer vacations; the most inexperienced fan will have little difficulty. The completed ship is above.



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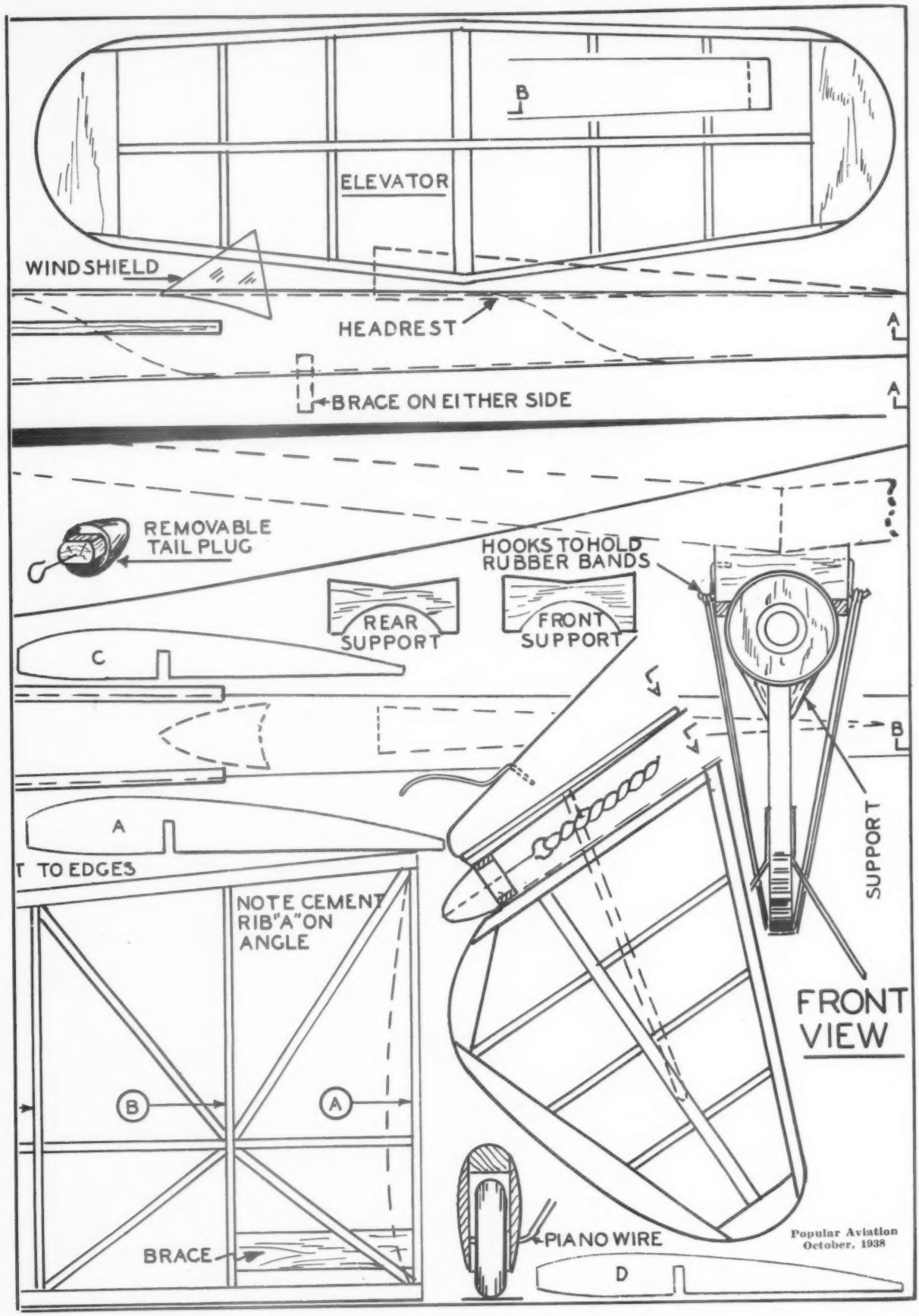
October, 1938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Power and Its Measurement

by RAOUL J. HOFFMAN

So much confusion exists in the mind of the layman concerning the actual definition of horsepower and the relation of power to force, that we had Mr. Hoffman clear up the matter in this excellent article.

SURPRISINGLY, experimenters and engineers are very adverse to making tests without the aid of the latest scientific testing units. The main reason for this is the necessary application of mathematics and basic laws of physics. With a few odds and ends, however, the finest test results may be obtained that will give at least comparative values; such would be the case testing engines for horsepower.

To grasp thoroughly the meaning of power (horsepower) the mechanics of rigid bodies will be explained:

A push, pull or thrust on a body (without moving it) is nothing else than a force acting on that body; this force may be internal or external. Only external forces will be considered.

The force is usually denoted in pounds, but other units may be used, such as ounces, kilograms and others. Graphically it is shown as a line having a certain length drawn to any convenient scale (Section 1). The force to lift a body is equal to the weight of the body. When no particular locality is given the standard weight of the pound body is one lb.

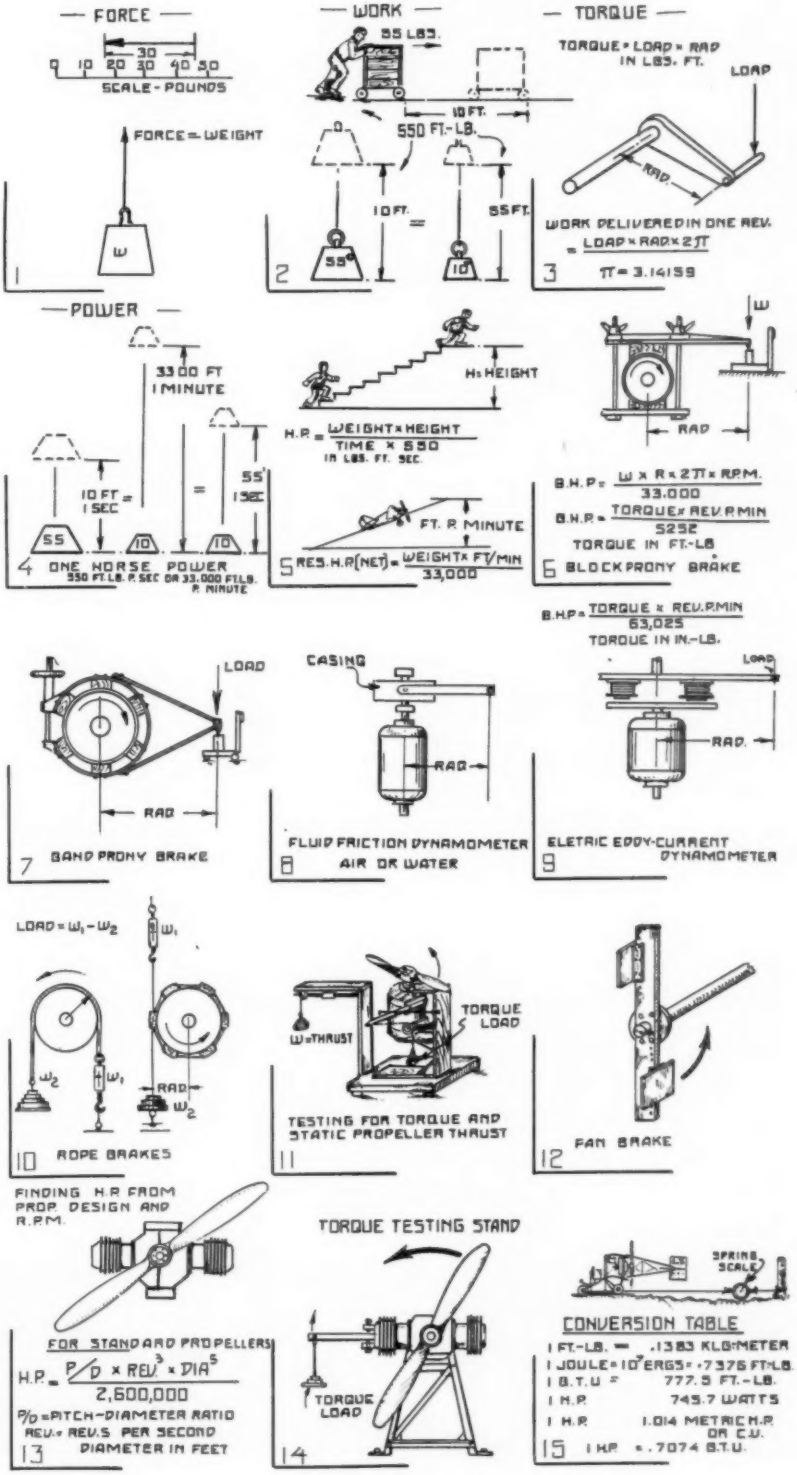
By pushing a body with steady force for a certain distance, work is delivered that is equal to the force times the distance. The work is independent of the time required. Section 2 illustrates the work done to push a packing case a distance of 10 ft. The force is 55 lbs. and the work delivered will be 55 times 10 or 550 ft.-lbs. The same amount of work is required to lift 10 lbs. to a height of 55 ft. or 55 lbs. to a height of 10 ft.

In some text-books, the word pound-feet is used to represent work to avoid confusion with foot-pounds of torque or bending moments.

A law of physics—the conservation of energy—states that work can only be created by equivalent work delivered and that no energy is lost. A body lifted to a certain height has potential energy that is equal to the work required in raising it. If it falls to the ground the moving body has kinetic energy, which can do the same work as it took to lift the body. Potential or kinetic energy may be converted into heat, light or chemical energy, but the sum of all will be the same.

Force and work of a propeller are very often erroneously used. Static thrust of a propeller should not be compared with the thrust delivered during flight. The static thrust is a force and the thrust during flight is work done in a certain time, which is called power.

Power is the rate at which work is delivered, or the units of work done in unit time. The unit employed by engi-



neers is the horsepower, which is equal to 550 ft.-lbs. per second, or 33,000 ft.-lbs. per minute. Section 4 shows the lifting power of one horsepower. Section 5 shows the formulae for calculating power and its application to two simple problems. The power indicated is for climbing only; it does not include the power necessary to keep the airplane in the air.

But not all forces act in a straight line. In Section 3 a force is acting at the end of a crank handle that will produce a turning moment. This torsional strength, expressed by the radius times the load, is called the torque. The units of torque is in ft.-lb. or in in.-lb. The work delivered in one revolution will be two times the torque or 6.28 times the torque.

The determination of the torque and the revolutions in unit time is the main object of finding the horsepower of an engine, using formulae noted in Section 6 and Section 9.

The instruments for finding power are dynamometers. They are of two kinds: those absorbing power by friction and dissipating it as heat, and those transmitting the power they measure for further use, losing only part of it by friction.

Usually the torque, or the load at the end of a torque arm, is measured. If standard weighting scales are used, the length of the torque arm is chosen so as to give the power in decimal multiple of the load. For laboratory work, however, direct reading torque meters are employed. They may be actuated by the gravity (weight) or by the torsional displacement of a steel spring.

The simplest dynamometer, shown in Section 10, has a pulley or drum attached to a rotating shaft and a rope passed half way around the circumference. Attached to one end is a spring scale and to the other end weights are added until the correct revolutions per minute are reached. The torque is found by multiplying the difference of the weights by the distance of the center of the rope to the axis of the rotating shaft.

Another design has the rope with oak or maple cleats passed around the whole circumference.

Section 6 and Section 7 show Prony brakes, which create torque loads by pressing wood blocks or cleats to the drum surfaces. The attached arms then indicate the torque force on a platform scale. Care must be taken that the line passing through the center of the shaft and the point of the torque arm is horizontal.

Very often the great heat developed

(*Concluded on page 72*)

Alaska—Aviation Stronghold

(*Continued from page 42*)

Under it the route was stepped off into lines and at the request of anybody who lived along the line, the mail carrier was obliged to stop—to pick up a letter or to leave one. No distinction as to class was made. The "mail" might be a postcard, a mail order catalog or a new pick handle! (In summer not even this service was given. Mail came to coast ports by boat and then moved inside by river boat or was passed from hand to hand until it reached the person to whom it was addressed. This still holds true in many regions.)

A decade ago the sourdough pilots began underbidding dog team mail men for these routes. Today there are 32 such routes serving the whole territory —all by plane.

The sourdough pilot, starting from Nenana to Ruby (the first star route won from dog teamsters) would fly low, or "drag", over a mailbox he saw sticking out of the snow and if a piece of old shirt tail waved over it he'd circle for a landing. Anchoring his plane down he'd wade through waist-deep snow, knock at the trapper's door and be received with a hearty:

"Hi'ya, Val! C'mon in an' set fer a spell. Pull up by the fire an' warm y'self —must be mighty cold out. Since thet dam' blizzard hit I aint budged from the shack. How's the poker game down tuh Joe's?"

Then, when all the news was passed, just to make the pilot feel better the Old Timer would scribble a note to some friend down the line, borrow a stamp from the flyer, and give him a piece of mail for his trouble!

"Val" Valley, pilot on that first route, regularly made 21 stops on the 190-mile stretch, some of them so close together he'd taxi over the snow rather than take off and land again.

These pioneer pilots risked their lives with every crossing of the unchartered tundra and rugged mountain ranges. Every charter flight—and there were no scheduled operations until a few years ago—was a problem in itself. Navigation was often by means of a sketch traced by some old prospector from memory. The pilot was his own meteorologist, mechanic and ground crew.

He tied his plane down on the snow for lack of a hangar. He drained the oil from his engine at night and took it to bed with him. He rose in the morning hours before his scheduled departure, put the oil on the stove and went out to "bake" his motor.

Covered by a canvas shroud extending to the surface of the snow, the motor was heated by a plumber's "pot" inside the covering. Two to four hours were required to warm a motor to the point where it could be turned over after the hot oil was poured in . . . two to four hours while the pilot stood by, shivering but alert, watchful lest the canvas blow against the "pot", catch fire and destroy the plane.

The Alaskan airman has fought an uphill battle. His one government-supplied airway aid is a beacon atop the Fairbanks Federal Building; his latest rebuff the refusal by the spendingest Congress in history to appropriate $2,500,000 for an airport development program.

He believes that industry can be maintained during the long winter months if transportation can be provided—if a means can be established to bring in supplies and transport products to the coastal ports and thence to the outside world. What he has accomplished to that end is aviation's triumph.

Airways have been built, radio and weather stations established, airports constructed and maintenance shops placed in service at strategic points on a year around basis—all at private expense. Pacific Alaska Airways alone has five miles of airway to every mile of highway and railroad—2,125 miles from Juneau to Fairbanks and from Fairbanks fanwise to Nome, Flat and Bethel, all scheduled routes. Additional airways are represented by 5,872 miles of "star" mail routes flown by a dozen independent operators. PAA, from central shops at Fairbanks, has established 15 airports and 13 weather and radio stations. Woodley Airways, with headquarters at Anchorage, has started installation of ten radio stations. The city of Anchorage is spending $80,000 for an improved airport and seaplane base.

Mr. and Mrs. Sourdough know all this and now, according to Delegate Dimond, they are watching the perfection of small, low-priced ships with keen interest.

"Airports are small and operating costs are high," said Mr. Dimond in an interview in Washington this summer, "so even the medium class ships are out of the question for the average private owner. However, if lightplane prices get below $1,500, the Territory of Alaska will offer one of the best markets for manufacturers in North America."

END

Letters

Thoughtlessness

Sirs:

In regard to the article ("Why They Jump," POPULAR AVIATION for July) . . . I am frank to say I don't like it a bit, even in your magazine. This data is all gathered from the files and records of the Irving Air Chute Company, the pictures published were also taken from the files of the Irving . . . company, the Caterpillar Club was founded by the Irving . . . company, and our company furnishes the insignia for this Club. Gathering this data together, plus the Caterpillar Club, has cost our company several thousands of dollars over a period of years, yet this article is published and insofar as I can find, and I have scrutinized it very thoroughly, it does not have the decency to mention that this data, photographs, etc., were by courtesy of the Irving company.

You can readily see our point, that after spending many thousands of dollars in getting our records on these things, they are used in such a way that would stop us from having same published where (the) Irving Air Chute Company would at least receive some recognition . . .

GEORGE WAITE,
President.
Irving Air Chute Co., Inc.
Buffalo, New York.

● Our humble apologies for not giving credit where credit was due. Let Mr. Waite also voice his justified complaint to the author, Lloyd S. Graham, 131 Delaware Road, Kenmore, Buffalo, N. Y.—Ed.

Sirs:

I read, in your July POPULAR AVIATION, "Why They Jump."

February 18, 1934, my son jumped from his Army plane (while atttemping a landing) at night . . . near Mansfield, Ohio. After reading (your) article, it occurred to me that a (Caterpillar Club) membership card and pin would make a nice Christmas present for him. Will you please advise me what procedure is necessary to obtain these? Of course, proof is written in the records of the War Department.

R. F. GIBSON.
Olney, Illinois.

● The father of American Airlines Pilot Jack Gibson can easily have his wish fulfilled by addressing the writer of the letter preceding his.—Ed.

Marbles

Sirs:

In your August . . . POPULAR AVIATION . . . "He Showed 'Em" by S. R. Winters says that Ben King set an airline record of 185.4 miles with a light plane. . . I have personally flown aircraft of no heavier poundage for longer non-stop distances—they were also stock models. In February of this year I left this town with a 1937 *Cub* (that had) 800 hours on it and flew to St. Petersburg, Florida, averaging 208 miles per stop and an air speed of 87 miles per hour . . . the craft was fully loaded at the time and had not had a major (overhaul) for over 400 hours. Three hundred miles of this trip was blind through Pennsylvania following the Susquehanna river without seeing the top of any of their much-discussed mountains. Upon leaving here I had only about 50 hours in the air, no compass or strip maps. Part way down I started flying with road maps and in the entire trip was never lost. If a record may be obtained by simply flying a light ship 185 miles I think I'll start playing marbles.

HILLIER THOMPSON.
Northbrook,
Ontario, Canada.

No Young Squirts

Sirs:

What do you mean by "old boys" ("Give the Old Boys a Chance", POPULAR AVIATION for May)? . . . The oldest one you could mention was only 60 years of age and he had been flying *five years*. How in the world was he ever able to get his parents' consent to start so young? I first touched the controls on October 31, 1937, and soloed in 10 hours as shown by the records of the Duck Air Service in Oakland, California. At (that) time . . . I was several months past 61 years of age. I now have my solo license with 11 hours of solo time. When I first read your (article) I thought that perhaps I had broken some kind of record, but inquiry has deflated my ego. I am not alone by any means. How about using your valuable publication to assist in forming a "Three Score Club"? Men who *soloed* after 60 years of age, not young squirts grown gray in service.

CLAYTON R. TINSLEY.
Berkeley, California.

● How about it, readers?—Ed.

Speed

Sirs:

. . . "Hurricane" on page 35 of (the August) issue states that the English (Hawker) *Hurricane* can attain a speed of 408.75 m.p.h. "The Man Under the Hood" states that Germany has a Messerschmitt Bf-109 that will attain a speed of 444 m.p.h. at 13,000 feet. . . I cannot recall of ever hearing of an American

(*Continued on page* 86)

Peculi AIR ities

IN POST-REVOLUTIONARY WAR DAYS, BALLOON ASCENSIONS FROM TAVERN GREENS WERE QUITE COMMON IN MANY TOWNS. WILY PROMOTERS OF THE ERA URGED BALLOON TRIPS UPON INVALIDS, CLAIMING THAT THE ASCENT WAS BENEFICIAL—THAT IT CAUSED A "SUDDEN REVULSION OF THE BLOOD AND HUMOURS."

Compression

(*Continued from page* 48)

to gasoline has certain drawbacks. For carburetor-fed engines provisions must be made to gasify the more reluctant alcohol, and in order to obtain equal power from an alcohol-blended gasoline, higher compression ratios than heretofore common will have to be adopted. But higher compression ratios without suitable provisions against detonation are well nigh impossible.

Today, the aviation motor fraternity approaches the matter of high compression ratios from a different angle, from a more logical standpoint, namely, to so construct the combustion chamber that detonation will not take place even with a fuel of an octane rating of but 80. The usual valve-in-head arrangement is customary for aviation motors.

Such a combustion-chamber layout as a whole is highly efficient in various respects, but it also possesses the undesirable feature that it most readily causes a tendency towards detonation.

Research work is now in progress that seeks to eliminate knocking caused by too high a compression ratio or too rapid a flame propagation, by attacking the evil at its source, i.e., the shape of the combustion chamber.

The all too rapid flame propagation inherent in combustion chamber designs of this type just discussed is the direct cause of the detonation ensuing when high compression ratios or a fuel of normal commercial octane rating is being used.

In addition to this serious handicap, too rapid a flame propagation has also a "blow torch" effect upon the piston-head, which in turn makes the use of large pistons (over 6¼ inch bore) quite impossible, for air-cooled motors at least.

The blow-torch effect of too rapid a flame propagation and combustion is shown by monographs.

For this test, the motor was run for a considerable time. Then the pistons were quickly extracted, their heads chemically treated, and photographed so as to bring out the effects of the uneven heat waves as they had struck the piston head, causing excessive heating in certain spots and much less heating in others.

That a blow-torch effect is detrimental to pistons—especially aluminum—is obvious, and the uneven heating of the piston-head undoubtedly is the cause of many engine failures in that excessive localized heat cannot as readily be dissipated as heat spread more evenly over the entire piston-head surface. That detonation adversely affects the moving parts of the engine is of course well known.

END

Future of Our Air Force

(*Continued from page* 12)

Well, look at Pan American Airways, a strictly commercial, entirely non-military organization. This summer they are scheduled to open passenger, mail and express service across the Atlantic with flying boats that are said to be capable of making the round trip non-stop. If the commercial flying boats can, the bombers can.

The men who really know say confidentially that, basing their conjecture on the present development of long-range military and commercial aircraft, it will be feasible within that five-year period for nations several thousands of miles apart to carry on a destructive war in which the armies and navies involved will be used mainly as anti-aircraft units, barring a development which will be taken up a little later.

By that time, there will be in existence—this is not fancy, but fact—airplanes capable of flying from Europe to the United States, or Asia to the United States, and returning without landing, bringing huge loads of bombs.

They will be able to make the round trip with bomb loads ranging as high as 100,000 pounds per airplane. Basing the figures on the plans of the manufacturers now interested in such ships, these aircraft will have a gross weight of around 400,000 pounds, divided roughly into one-third fuel, one-third the aircraft itself, and one-third useful load, including the crew, defensive weapons and the high explosives.

This is not idle conjecture. It is, rather, the expert opinion of those who are designing and superintending the construction of the amazing airplanes with which our air forces are being armed. The super-flying fortress is only a small scale example of "things to come." It is already obsolete; soon it will be dwarfed by bigger bombers, with greater load, speed and range. Some of these are reported to be already under construction.

However, the size and efficiency of the bomber itself is of no consequence if the bombs don't hit their targets. C. B. Allen, aviation editor of the New York *Herald Tribune,* and himself an air reserve officer, summing up the recent maneuvers deplored the refusal of the air force officers to reveal, or permit to be revealed, the efficiency of the Army bombing.

The Navy has always claimed that airplanes can't sink battleships. Allen asserts that if the bombing is satisfactorily accurate, the public should know it for its own satisfaction and feeling of security, and that if it is bad, they should know why it is bad and what is being done to correct it.

I can't say that the Navy is wrong in asserting that a bomber can't sink a battleship, although it seems to me that if a 2,000 pound concentration of T.N.T. struck alongside or on the deck of any man-made vessel, it would appear logical that something more than air and water would give way.

I can tell Allen, and any others who may be wondering, without revealing any military secrets and without violating confidences, that I have seen airplanes of the G.H.Q. Air Force drop bombs from amazing altitudes with remarkable accuracy.

I know, because I have seen what they are capable of, that at very high altitudes the bombing done by our Army airplanes—and the Navy flyers must be as good—is so accurate that I would hate to be in an aircraft factory, were it surrounded by a thousand anti-aircraft guns, which had been designated as the objective of Army bombers flying so high they were out of sight.

The Navy sneers publicly at the efficiency of bombardment aircraft, presumably even its own, and repeatedly brings up the several-years-old fiasco when the Army airplanes couldn't find a small steamer they had been directed to bomb.

They can continue to sneer, but in recent months the big battleship boys have been shown secretly that the Army bombers not only can seek out and find a dreadnaught hundreds of miles off the coast, but that, once finding it, they can hit it, and hit it so often in one raid that it appears fantastic that, if it were an enemy ship, it would not be put out of commission.

Because everyone concerned—except the public that foots the bills—knows that both Army and Navy flyers can hit their objectives under the most adverse conditions, thanks to equipment which has no equal; because they know what is developing in the way of new aircraft, and because they believe it is safer to assume that what we have in the way of weapons, some potential enemy also may have, they have formed in their minds a harrowing picture of the next war.

Let's take a look at it, and see why so many military men think a separate air force is inevitable.

(To be continued in our next issue.)

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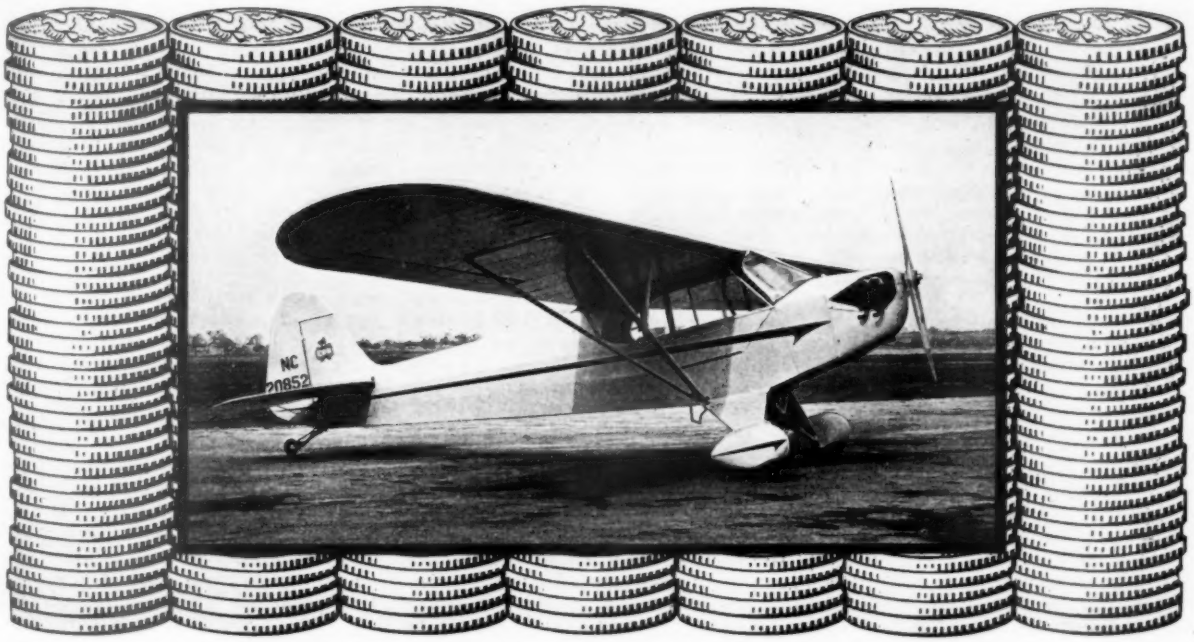

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It Gets In Your Blood

(*Continued from page 21*)

throttle closed; otherwise the engine might fly to pieces. Sometimes they have. The speed of the airplane is held down because it (the ship) compresses the air in front of it. Speed is held down also by the drag of the "windmilling" propeller. Actually, an idling propeller has more air drag than if it were stopped.

The terrific howl of the diving airplane raises a racket that might wake the dead and I have been told that it has shaken a roof ten miles away! This noise is caused mostly by the propeller tips being driven far above the speed of sound. Peculiarly, I have never been bothered much by it, perhaps because this racket is outward in the plane of propeller rotation so that it is not nearly so intense in the cockpit.

Bumpiness is another thing that I have always had to watch. You can compare air bumps to waves in the water. Speedboats have to throttle down in choppy seas to keep from pounding to pieces. At diving speeds, air bumps can smash an airplane like blows from a tremendous sledge hammer. That is why tests are run in the altitudes of between two and five miles. Also—although I never like to use a parachute—that life-saver gives the pilot a far better chance to get out safely should that necessity arise.

The average flying life of a test pilot has been figured to be about two to three years. Some of them have died with their boots on. Others wisely have retired to other and safer pursuits and a few have been forced out by disability. I have been lucky in that I am still on tap—the grim reaper has shaved me closely several times but so far has let me go by.

Most companies slap a good insurance policy on their test pilots. Personally I would much rather live to spend the premium. Two years ago, several of my friends chipped in a quarter apiece and bet me that I would not be alive in a year. They even wanted to offer me odds, but in the true spirit of sportsmanship (and having as much faith in my star as they had in theirs) I rejected them. There was nothing personal in their bets, I can assure you. It was just that they felt mine was about the most hazardous profession of them all.

But there is no other industry on earth where everyone concerned with the job tries so conscientiously to turn out the best product possible. When I consider that upon me depends, to a certain extent, whether or not those other people will be able to work and eat, in justice I do my best. They have as much faith in me as I have in them . . .

That, and my inherent dislike for parachutes (although I would not take off without one for the world) is one reason why I have never abandoned a ship when there was the faintest possibility of bringing it down safely.

Some pilots have tried this, and waited too long—tried to bail out when it was too late. While testing a Great Lakes BG-1 dive bomber, once, most of the fabric on the upper wing ripped off; left for parts unknown. I still had a perfectly good lower wing, and it seemed to me logical at the time that I would be able to come down safely; the ship still handled itself fairly well in the air.

The first step was to fly over the river and drop the 1,000 pound dummy bomb slung underneath the fuselage. Then, a cruise around a bit to lighten the gasoline load. The observers on the ground must have been wondering whether they were going to have an airplane to look over when I was finished.

I tried to bring the ship in fast. It got out of control for a moment, so I set her down on two wheels. After bouncing along like a drunk on a pogo stick for a while, jouncing my neck back against the head pad, the ship finally settled down for a fairly decent three-pointer. I had thus avoided the necessity of a 'chute jump—and the manufacturers still had an airplane they could sell.

Some time later I was called upon to finish the tests on the same model of Grumman pursuit that Jimmy Collins had been killed in. Jimmy was a fine pilot, one of the best there ever was; to this day nobody has ever been able to figure out just how he had lost his life. Some pilots believe that a plane that has broken up is liable to give the next "guinea pig" more trouble. I never believed much in jinxes—and anyway, the only way in which to find out is to go up and try.

The first couple of days went off smoothly; the plane behaved like a sweetheart, and we were ready for the final demonstration dives. Everything went along fine, until I had only two ten-turn spins to perform. That's when luck kissed me goodbye, and with it, the ship.

After having finished the initial ten turns, the airplane would just not pull out of the spin. I tried all the tricks of the trade, including that of standing up in the cockpit and leaning forward as much as possible in the fervent hope that this would change the air pressure and balance. But it didn't help me any in this case. Inasmuch as I was running out of altitude, I concluded that this was time for me to leave. I hated to quit such a nice airplane, too.

I got out at around 2,000 feet and as I tumbled end over end, I looked up to see the plane spinning practically above my head. I held on to the rip cord as long as I could, hoping the wind or something would change our paths. But it didn't work out that way and at 400 feet I had to yank the chute open and watch the plane whizz by a few feet away to smash into a tree not far away, while I plumped down easily on terra firma. I have "hit the silk" four times in my career—and hope that will be all.

But that is all in the game. The test pilot's job is to take an airplane up and try to get it into trouble. It is only in that manner that our military services will be sure of getting top-notch aircraft. Not all of test flying is concerned with just seeing that engines will shake themselves to pieces, or wings come off. Test pilots have to be capable of understanding the airplane thoroughly, and watching out for little tricks that may affect the plane's performance.

On one of the jobs I worked on several years ago, we found that all the small fairings and cuffs would be blown away during preliminary dives. More thorough inspection and some hard work soon fixed this up. The same job had one of the new twin-row 700 h.p. engines to help kick it around. At that time these power plants were

(*Concluded on page 68*)

IF IT'S MORE THAN 100 MILES FLY!

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Travel experience says go on Flagships.

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The American Standard of Service

The Birdmen's Perch

FINAL ELECTION RETURNS: The bird and the propellor are hereby making their last appearance on the Perch until we either see such a collision for ourselves or someone makes a full-color, slow-motion movie of one. The result of our election was a deadlock: neither group had a majority, which proves exactly nothing. So as far as we're concerned that's that. Anyway, boys, no matter what side you were on, it was a swell argument.

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," Mgr., Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

POETS' CORNER

One of our favorite correspondents is W. Blake Henderson. There's a man who fairly leaps into action at the sight of our puzzles . . . sends us slightly sarcastic answers worked out to 10 decimal places, when they're too easy, and gracefully inquires *in verse* when one has him stumped a little.

Fact is aviation bugs are pretty poetic. We're serious . . . one of these days you'll see a regular Poets' Corner in the Perch if we have to award a monthly prize (as yet un-named) for the best sonnet about Gulfpride and the Alchlor process!

At any rate, Poet & Puzzler-Laureate Henderson's offering is a mite long to be printed, but we'll give you the last quatrain. It's about our June puzzle . . .

"So I want to know:
What *is* the answer?
If the wind *did* blow
Which way—*how* fast, sir?"

SHARPEN YOUR PENCILS

On our library shelf there are three volumes comprising a work called "Why Every Aviator Should Use Gulf Products." They stand in order on the shelf and are labelled Vol. 1, Vol. 2, Vol. 3.

Vol. 1 has covers each 3/8" thick and

the leaves when pressed together are 1 6/7" thick.

Vol.2 has covers each 3/8" thick and the leaves when pressed together are 2 3/16" thick.

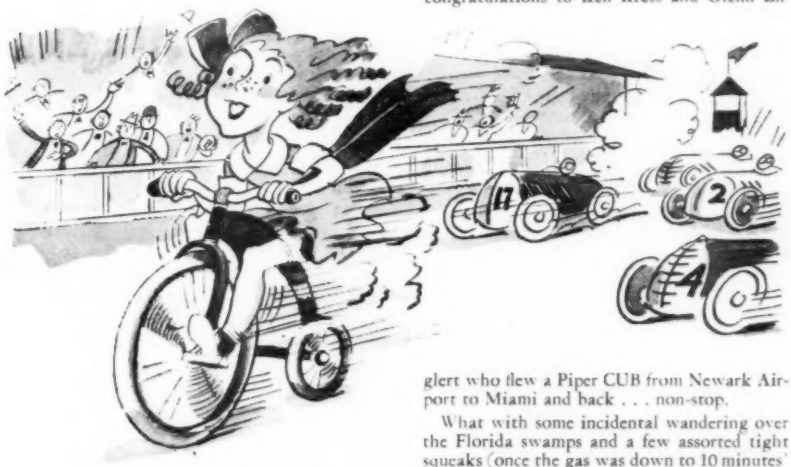
Vol.3 has covers each 3/8" thick and the leaves when pressed together are 3 5/16" thick.

The Volumes are page-numbered as follows:

Vol. 1 from 1 to 60
Vol. 2 from 61 to 150
Vol. 3 from 151 to 300

Now, a book-worm begins at Vol. 1, page 1 and eats directly through to Vol. 3, page 300 by the shortest route. How many inches does he (or it) eat through?

(Send your answer to T.W.T. to see how good you are.)



THIS MONTH'S WHOPPER

Dear Major:

One day, when I got home from work, I see a whole slew of reporter fellows taking pictures of my little Sally and asking her a million and one questions.

It seems that Sally—she's going on 7—won some sort of a big race.

How'd it happen?

Well, last Christmas I bought Sally one of those tricycles. And it seems that on this particular day she finds a can of Gulf Aviation Gas I had around. And she sprinkles some on her tricycle just for the fun of it.

Well, sir . . . first thing you know, she's shooting off on the thing like a bat out of the hot place. Heads right for Grantham Avenue where they have the auto races. Can't stop the darned craft! Goes lickety-split through the fence and right out on the track! And darned if she doesn't find she's in a race with some of the fastest drivers this side of Indianapolis. Laps the field once! . . . laps 'em twice! . . . and scoots over the line winner by a whole brace of furlongs! Only thing is she can't stop and they have to put a net over the track to catch her.

I don't think racing's any life for a kid just going on 7 and so I've forbidden Sally to touch my Gulf Aviation Gas till she gets older. **Hal Bers**

CITATION

Slightly late but none the less sincere are our congratulations to Ken Kress and Glenn Englert who flew a Piper CUB from Newark Airport to Miami and back . . . non-stop.

What with some incidental wandering over the Florida swamps and a few assorted tight squeaks (once the gas was down to 10 minutes' supply) the boys packed quite some experiences into their 63 hr. 54 minute meander. Flights like theirs are worth-while contributions to aviation . . . so again congratulations!

Incidentally Kress and Englert used only Gulf Aviation Gas and Gulfpride Oil on this flight and report perfect performance from both. And a credit also to the Gulf crews at Newark, Raleigh, Jacksonville, and Miami who helped in the ticklish refueling.

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF **GULF AVIATION PRODUCTS**

Do You Know . . .

. . . THAT in 3 days and 19 hours Howard Hughes and his able companions, flying a Lockheed 14 transport powered by two 1100 H.P. Wright Cyclones, reduced by half the popular conception of the size of the world.

. . . THAT it is a tribute to modern engineering that this record-breaking flight was established in a standard transport airplane, a Lockheed 14, of the type now in service on leading airlines both here and abroad, particularly on K.L.M. (Royal Dutch Air Lines) and K.N.I.L.M. (Royal Netherlands Indies Airways), where they are powered by Wright Cyclones.

. . . THAT Wright Cyclone 1100 H.P. engines of the type selected by Howard Hughes for his Lockheed 14 power transports on American Airlines, Eastern Air Lines, Pan American Airways System, and Transcontinental & Western Air. Recently released for export sale, Cyclones of this type are also installed in transports now in service on K.L.M. (Royal Dutch Air Lines), K.N.I.L.M. (Royal Netherlands Indies Airways), Pan American Grace Airways and Swiss Air Lines.

* * *

. . . THAT the engine used by Douglas Corrigan for his cross continental nonstop flight from Los Angeles to New York, and in his plucky return hop from New York back to the west coast . . . of Ireland . . . was a Wright 175 H.P. Whirlwind.

. . . THAT Corrigan's plane, a Curtiss Robin, was built at the St. Louis Aeroplane Division of the Curtiss-Wright Corporation in 1929.

. . . THAT besides the impressive, record-breaking flight of Howard Hughes and the spectacular flight of Doug Corrigan many other outstanding flights have been made with Wright Cyclones and Whirlwinds. A few of the most noteworthy of these were Charles A. Lindbergh's non-stop flight from New York to Paris, Admiral Richard E. Byrd's flights over the North and South Poles, Kingsford Smith's flight around the world, and Colonel and Mrs. Charles A. Lindbergh's 30,000 mile flight covering 31 countries and colonies, including crossings of the North and South Atlantic Oceans.

"Fly with Wright the World Over"

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A DIVISION OF CURTISS-WRIGHT CORPORATION

It Gets In Your Blood

(*Continued from page 66*)

still considered in the experimental stage. This one ran too hot on the ground and when I was climbing the ship. A few minor changes took care of that.

Similarly, continual flying resulted in the landing gear showing a few tricks of its own, due to insufficient snubbing action in the shock absorbing struts. Once, when landing on a rough field, the fittings on a longeron tore loose and a landing gear support tore through the bottom of the fuselage and into the cockpit—to just miss tearing my spine apart by a hair's breadth. The experts had not figured on these things, but there they were.

They do try their very best, though. It has always been an expensive procedure all around. But when you scatter an airplane into several hundred parts, you can replace it. Modern science hasn't been able to do as much for the pilots.

Many people have told me that I am just a crazy fool to do dive testing. To them, there are much easier ways of attempting to commit suicide. I can agree with them upon that point. In contrast, I tell them that I like my work. It is never dull, and there are always new problems cropping up that have to be met; new situations that call for fast thinking and alert movement. And the pay isn't bad—while it lasts.

A test pilot usually will get anywhere between $1,500 to $5,000 for a complete testing job that may take anywhere from a few weeks to several months to complete. Most of this time is not spent in flying—the airplane is being taken care of by mechanics, inspectors and engineers and the pilot has a chance to loaf around and rest.

These prices may sound high to the average man, but a lot of things must be taken into consideration. Remember that in practically all cases the test pilot's fee is but a fraction of one per cent of the amount involved—if the airplane is successful and the manufacturers succeed in getting contracts. Also, an experimental plane may cost anywhere from $200,000 to $500,000 in work and research, and it is the pilot's job to protect that investment. And to repeat again, the airplane can be replaced. But if the pilot is ripped apart, it is final. The work is not what one would call steady employment; there's always plenty of "leisure" between jobs.

You have to be endowed with a strange sense of humor that makes one enjoy hurtling earthward two or three miles at terrific speed and pulling out at a pace the ordinary man could not survive. I try never to worry about my job. I smile at it—even when occasionally I have to be patched up to be in shape for a new test.

END

Airy Chat

(*Continued from page 8*)

about change that has taken place, during the past few years, in airplane safety and stability devices. During the present era we have seen intensive development of complex mechanisms known as "robot pilots" for the automatic stabilization of airplanes.

Ten years past, the trend was in the other direction, the development of self-stable wing surfaces or, as it was then known, "inherent stability." It is seldom that we now hear of inherent stability, so great has the trend been toward stabilizing methods, but I still believe that it is better to build stability into the ship so that instability is checked before the upsetting couple is established rather than to attempt correction of the couple after it has, at least, partly deviated the ship.

* * *

THE great argument against inherent stability is the oft-repeated statement that an inherently stable ship is not maneuverable. That is to say, a plane having an inherent stability of 100 percent could neither be steered, elevated or depressed but would continue straight on of its own sweet accord.

Academically speaking, this is probably correct when accepted at full face value, but in practice this can be very considerably modified. It is not required that an airliner, of the usual type be highly maneuverable and thus we might strike a compromise of 80 percent inherent stability and 20 percent maneuverability that would dispense with a whole lot of complicated mechanisms and electrical apparatus that basically are not long lived.

* * *

APPARENTLY, the great subject now under discussion in Washington, and points beyond, is: To sell or not to sell our helium. So far as I am concerned, the answer is—NO!

In the first place, helium is a natural product, limited in volume and is one of our important natural resources. It does not gush up out of the earth in vast quantities like petroleum but must be painfully extracted, cubic foot by cubic foot, from the natural source. In times of immediate necessity it could not be put into volume production like steel or gasoline but must be drawn from stores already accumulated.

To sell a great amount, or any amount for that matter, of helium to a foreign power at the present moment would place us in a predicament similar to the airplane spruce predicament that we experienced during the World War. When we started to build wartime aircraft for the war we found, to our dismay, that Germany had purchased the pick of the spruce and hauled it out of the country several years before. And we, as usual, used what was left.

END

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NEW COWLING DESIGN WITH CONTINENTAL 50 MOTOR IMPROVES COOLING AND STREAMLINES APPEARANCE

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Shoot 'Em Yourself

(*Continued from page 56*)

shades in general use on nearly all outdoor work.

The place of the sun deserves special consideration in capturing airviews. Although pictorial workers have long since discarded the box-camera cry, "Keep your back to the sun," the thought is a good one in the matter of air shots. Shooting into the sun, even though downwards and completely out of range of the direct rays, invites difficulty. Here haze is most noticeable since the sunlight strikes it obliquely from ahead of the camera. You will get pictures even under these conditions, but they are apt not to have the snap and brilliance of those taken over the 190-degree arc away from the sun. Back-lighting is grand on terra firma but has small value aloft.

The exception to the rule—there must be an exception—comes at sundown. Those beautiful cloud formations, when the sun is betwixt and between, are the *hors d'oeuvres* of the aerial camera. They are props and back-drops for prize winning pictorials. When the sun dips behind the silver-tinged masses and the universe is painted in crimson and gold, let your imagination romp and camera have free play. You will not be disappointed.

Unless you fly your own plane or are in a position to suggest the most desirable angles to the pilot, you will be obliged to snap your pictures from whatever angle you can get them. Nevertheless it is worth remembering that the terrain flattens out considerably as the horizon broadens. One should cast about for kindly devices that suggest depth and perspective in pictures.

Just as on the ground, an appearance of depth and perspective in buildings may be caught by including two sides of the buildings. The illusion is further improved if one of the sides is more brightly lighted than the other. Pictures are built of light and shade. Less frequently you may also be able to use another popular dodge of the camera on terra firma—this device is the use of a single prominent object in the foreground to lend striking contrast to the remainder of the picture. In the airview a nearby skyscraper, a stray mountain peak, a bank of clouds, or even another plane may be this nearby object.

In the absence of a single dominant feature on which to hang the picture, one resorts to patterns. Patterns are the life blood of aerial photos. Patterns are the exclusive property of the air camera. These patterns may be the carefully planned scheme of a landscape architect or patterns born of rivers and highways that grew into being with no thought that they would one day be the hunting ground of the aerial camera hawk.

END

Aviation's Father Time

(*Continued from page 28*)

They wouldn't have him as a second lieutenant pilot—but finally signed him as chief civilian instructor at Wright Field, Dayton, and later as chief instructor at Call Field, Wichita Falls, Texas, at a brigadier general's pay of about $10,000 a year.

Among his associate instructors were Edwin Musick, the famous Pan American Airways pilot; Wallace Culbertson, another Pan American pilot; Lawrence Leon, and Cy Zimmerman, who flew on the old Aeromarine Airline.

Hall's job was selecting instructors and of teaching officers and "dodos," the awkward birds who couldn't make the grade. And he had numerous run-ins with the medical end. Once a physician sought to reject a favorite student, a fine upstanding cadet, for a minor eye defect.

"But," protested the doctor to Hall, "he can't fly with such a defect."

"Hog wash!" stormed Hall. "It doesn't take perfect vision. I can fly with one eye shut."

"Go on," laughed the doctor, patronizingly. "If you do, I'll pass him."

Now, if you've got two good ones, that's a hard feat, since it throws your judgment of distance off. But Hall had the doctor put a wad of cotton over one eye, pasting it down with adhesive tape, and he took up a Jenny, putting it

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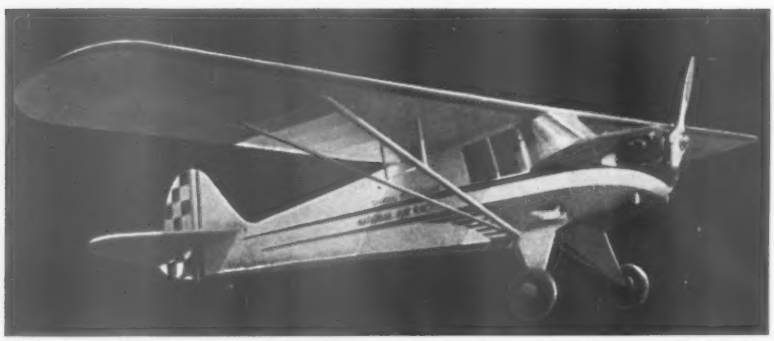
40 H. P.



50 H. P.

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Smart operators have found that the EVEREL Single Blade actually pays for itself in gas economy in around 1,000 hours flying. Write or wire for full particulars on the newest step forward in aviation.

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through the paces. The student got by and became an outstanding Army aviator later.

Hall frequently is asked:

"Did you learn to fly in the Army?"

He usually replies:

"Hell, no! I taught the Army to fly."

He almost did, too. He taught hundreds of Army aviators. Among his better known students are Ralph Devore, former chief pilot of Trans-American Air Lines; A. J. Mackenzie, of the Bureau of Air Commerce; "Casey" Jones, former head of the Curtiss airports and now a consultant and pilot; Floyd E. Evans, director of aeronautics of Michigan; A. W. Vance, famous mail pilot; Al Price, who later taught Jimmy Doolittle; R. C. Allen, chief pilot of the Deep Rock Oil Company.

Came the end of the war. Hundreds of pilots were thrown out of jobs. Some left aviation. Others became barnstormers, and Hall established probably the country's first passenger airline.

There was an oil boom in Texas. Burkburnett had just been established. Transportation was poor, So Hall established an airline between Wichita Falls and Burkburnett, charging $90—or $1 a mile—per passenger for the 90-mile flight. And there were plenty of passengers.

Using a Hisso-engined Lincoln-Standard biplane, he could, with careful packing, handle three passengers at $90 each, or $270 for the 90-mile flight. The line made plenty of money for two years.

Once, he helped to land a million-dollar oil contract, and earned $500. A man came to the field late one afternoon, and inquired:

"Can you take me to Dallas today? I'll pay $250."

No trains were running, highways were closed, a storm was approaching and the only available plane was a Curtiss Jenny. Now a Jenny was a gosh-awful crate with which to buck bad weather. A tremendously big ship with acres of wingspread, miles of wires and almost no instruments—and slow! A good breeze that will ruffle the leaves would slow it to a walk.

". . . and another $250 if I get my contract," prompted the caller.

Hall took the job, flew the first 55 miles in one hour and 45 minutes, flying full throttle, and eventually, eons later, reached Dallas. But the oil man got his contract and Hall got his $500.

Hall re-established his flying school at Warren, Ohio, in 1922. But instruction prices were coming down. Instead of $90 an hour, he got $60 in 1922, then $30 in 1927. Today, the usual price in light ships is $6 to $8 an hour.

He had an amusing experience once in barnstorming. Folks in a little town he visited never before saw a plane close at hand, and he had plenty of passengers at $10 each willing to defy death. A youth and a girl approached the plane while Hall was occupied with a small task in his cockpit and the youth inquired:

"How much for rides?"

"Ten each," replied Hall, without looking up. The girl and the youth climbed in, and Hall, occupied with something else, forgot to take their money. He took off, made the usual circuit, and landed. As the ship rolled to a stop, the youth commented:

"Swell ride; well worth the money."

And he handed Hall 20 cents. No, he didn't have the other $19.80.

When the Bureau of Aeronautics was formed in 1926, Hall was first refused a license because of his weak eyes, although he had 17 years of experience and over 5,000 hours then. But later he was given a transport license which he still holds.

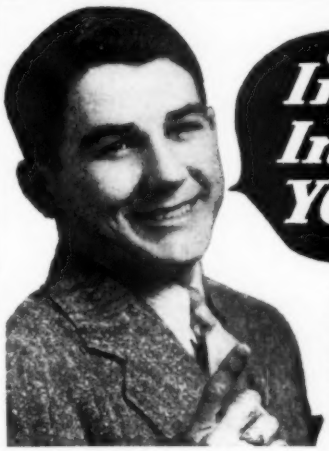
Hall became assistant state director of aeronautics, January 1, 1936, under Major Fred L. Smith, the state director. Major Smith resigned to become assistant to the president of the National Aeronautics Association and later to become chief of the airport traffic control section of the Bureau of Air Commerce, and Hall succeeded him.

How long will he continue to fly?

"Let's see now," he muses. "I'm only 46 now, and there are men 60 or 65 or 70 years old who are still young enough to fly. . . ."

So today Ernest Craft Hall, the man "experts" insisted never would be able to fly, is a leading figure in modern aviation. As Ohio's aviation leader he is doing a job well worth even more recognition than he has so far received. He is keeping Ohio on the aeronautical map.

END



I'm Getting Into AVIATION YOU Can TOO!

Yes, sir! Indeed you CAN get into Aviation! Carl Loftis, the Lincoln Student pictured here, is just a regular fellow, like you. He had no special training when he came to Lincoln. Held no degrees . . . no silver spoon in his mouth. No . . . you don't have to be a genius to get into Aviation. All you need is *ambition* . . . an *eagerness to learn* and the benefit of . . .

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Power and Its Measurement

(*Continued from page 62*)

by such brakes must be carried away by cooling water. To overcome this inconvenience dynamometers are used that drive an impeller, in a casing that is rotatable, with an attached torque arm, shown in a sketch in Section 8. The medium may be water or air. The variation of resistance is accomplished by changing the distance of the vanes or the discharge pressure. The brake horsepower is calculated in the usual way by a lever arm and scales.

The use of air is very advantageous in testing air-cooled engines by having part of the air passing over the engine to give conditions similar to flying conditions.

Another type of dynamometer uses the eddy current created by a number of electromagnets and one or more copper disks as indicated by a sketch in Section 9. Varying the distance between the magnets and the disk changes the torque that may be measured any convenient way.

One method used in measuring high powered engines is to connect an electric generator to the main shaft. Knowing the efficiency of the generator, the output indicated (kilowatts) times the efficiency is the power developed. The produced current may be utilized by feeding it a power line of the factory.

This system is costly to install but it is very economical in the running cost, especially in testing electric motors of large power that use the same kind of current that is generated. Feeding it back to the line, the losses are only a few per cent of the total power developed.

For approximate methods of finding the horsepower of high-speed engines, air-brake dynamometers are suitable. The plates, having an area of one square foot, are adjustable and the resistance calculated with standard areonautical formula. The fan brake is the most compact unit but it will not give very reliable results. (Section 12.)

Section 11 shows a testing assembly for measuring the static thrust of a propeller and the torque of the driving motor. The motor swings on two ball bearings that rest on brackets of a stand. Attached to the base figures is a torque arm from which a silk line runs over a pulley to a tray for weighing the torque load. Placing the stand on a platform scale the static thrust may also be measured.

Testing airplane engines for power can be simplified by using propellers of similar designs. Knowing the power coefficients, the power developed may be calculated if the r.p.m. are also known.

Another method of using propellers for testing engines is sketched in Section 14. The engine is mounted on a swinging frame placed on a stand. The torque created by the propeller may be measured with the torque arm in the regular way. The engine should be mounted in the same manner it is mounted in the airplane in order to give the same power.

Finding the power delivered by the engine and also by the propeller during flight is accomplished by attaching hydraulic cylinders radially and axially between the propeller and the engine shaft. The r.p.m., the pressure in the cylinders and the flying speed will give the efficiency of the whole unit.

This scientific method of ascertaining performance qualities of engine and propeller can not be compared with the crude methods applied to pre-war pushers by using a spring scale for determining the correct power of an engine. (Section 15.)

There are torsion dynamometers that use the angular twist of a long rod or long shaft. Their most important application is measuring horsepower of marine propeller drives.

In the above mentioned methods the inch, foot and pound units were used. Nevertheless, other units of various branches of engineering may be employed to simplify mathematical operation. Some of them are noted on the conversion table in Section 15.

END

Man Under the Hood

(*Continued from page 46*)

. . . He knows the industry inside and out . . . He is a close personal friend of **Colonel Lindbergh** . . . It is that friendship that coincidentally helped him win the **Pulitzer** prize for outstanding reportorial work in 1936 . . . "Deak" scooped the world on the story that **Lindbergh** intended leaving the United States permanently . . .

* * *

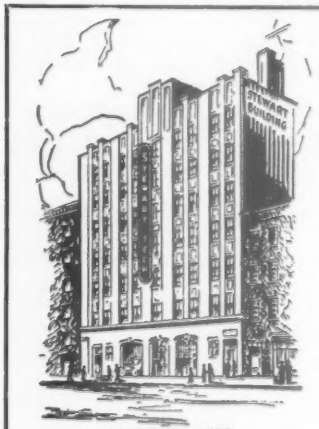
The Ryan School of Aeronautics at San Diego has been preening itself over **Douglas Corrigan's** flight to Dublin . . . Corrigan earned a good deal of instruction at the school, because he was willing to do any job given him, in return for a little flying time . . . **J. J. "Red" Harrigan,** who manages Lindbergh Field at San Diego, was **Corrigan's** first instructor at the Ryan School . . . They went 'round and 'round in OX powered Jennies . . . **Corrigan** became known as a first-class workman and consequently was chosen for the crew that worked on **Lindbergh's** ship . . .

* * *

While Americans sheer away from promotion of any national flying club program, the **British** are into this up to their ears . . . They have recently organized what will be known as the **Civilian Air Reserve** . . . It will consist of private flyers who have been trained up to a certain degree of proficiency in private flying clubs . . . The government pays a subsidy of from $250 to $500 for each member of the Civilian Air Reserve trained by any given club . . . This makes it possible for the clubs to reduce flying rates to *sixty cents an hour for light airplanes*—those with from 40 to 60 h.p. each—and to *one dollar and twenty cents an hour for airplanes with ninety horse power.*

Imagine what that means to our English friends . . . Airplanes equivalent to the Warner Fleet or the Waco F with a Warner can be flown for $1.20 an hour . . . And stuff as light as a Taylorcraft, Aeronca or Cub can be had for $0.60 an hour . . .

END



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- ☐ Deluxe Combination—includes a new Ryan S-T-A plane with complete commercial course.

GROUND COURSES
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- ☐ Airplane Drafting and Design
- ☐ Master Mechanic
- ☐ Master Mechanic and Flying
- ☐ Aircraft Welding
- ☐ Advanced Navigation
- ☐ Master Radio

Name_____ Age_____

Address_____

City and State_____

Airmark Your Town

(*Continued from page 26*)

Mrs. N.: "Have you lived here long, Mr. Jones?"

Mr. J.: "All my life."

Mrs. N.: "Tell me, where is the airport?"

Mr. Jones looks around and usually admits that he hasn't the slightest idea. Mrs. Noyes then goes into her sales talk, explaining how an air marker on the roof of the 1st National Bank building, with an arrow pointing toward the airport would help some pilot who needed to find a safe landing place. Result: Mr. Jones is sold on air marking and "Jonesville" shortly joins the ever-growing list of air marked towns, and in addition aviation has one more convert.

The Bureau has made a careful study of air marking, and has available a fund of information on types, recommended size, color and location, and costs and methods of installation markers.

Generally speaking, the Bureau has two type classifications of markers—roof markers and ground markers.

The Bureau recommends that roof markers be installed on large prominent structures, preferably located near railroad lines or highways. There are many structures available for the markers; warehouses are excellent, and factories, office buildings, grandstands, storage tanks, school houses, hotels and even churches are splendid sites. (The roof of the magnificent Mormon Tabernacle at Salt Lake City, Utah, is air marked.) The roof selected should, of course, be visible from various angles aloft, not obstructed by some taller neighboring structure.

Ground markers are usually constructed of crushed stone or cement set in the ground. In many cases there are painted inscriptions on the surface of some main highway.

In the case of painted markers, the Bureau has found that chrome yellow lettering, preferably against a black background, affords the best visibility from the air. The crushed stone or cement markers should be of white material and left unpainted.

Lettering on markers should be from 10 to 20 feet or more in height, so as to assure readability from fairly high altitudes.

The inscription of the markers varies according to location. Town markers should give the name of the town and the abbreviation of the state, an airport symbol (circle and arrow) pointing to the nearest airport and giving the mileage, and a meridian or north arrow. Intermediate town markers, placed at small localities on the route between larger towns, should bear the name of the town, a north arrow, and directional arrows pointing to the larger towns and giving the mileage to them. Ground markers, painted on highways, should bear the route number, the north arrow, and directional arrows pointing to towns or airports, giving both names and mileages. Very often ground markers, particularly those constructed of stone or cement, merely give the name of the town and state.

Ground markers should be placed at strategic points, such as atop hills, or on highways, in sparsely settled sections of the country. They should have directional arrows pointing to the nearest town.

The cost of installation of air markers varies, of course, with the different states, and even with the different localities in the states. Bureau records show that, in the case of state-wide air marking programs, the cost has ranged from $18 to $78 per marker.

In such towns as are not able to secure public funds for the installation, air markers could very readily be placed without any cost to the town itself, by having volunteer painters using paints and brushes supplied by some civic-minded individual or organization. The actual labor involved in painting the marker is slight, and owners are usually only too glad to cooperate by permitting the use of the roofs of their buildings when the value of the marker as a safety measure to airmen is pointed out. Permission is almost invariably forthcoming for the placing of markers on government-owned structures.

Once a marker has been installed, it is necessary that it be maintained and kept in legible condition, for the best located marker in the world becomes valueless if through neglect and lack of care it is allowed to become illegible. Painted markers will need periodic repainting and ground markers will need such care as will prevent weeds and grass from rendering them illegible. Civic pride is usually sufficient incentive not only for putting in the markers, but also for maintaining them, providing some one makes it a point to prod that pride at the proper moment.

Air marking is not spectacular, and for that reason it is sometimes difficult to arouse sufficient public interest in it. A town whose citizens will back to the limit an airport construction program may not evince much interest in an air marking program, simply because it costs so little and does not let the people on the ground see what has been done. That value must be pointed out.

To date, the air marking program has had remarkable success. A number of states have reported to the Bureau that they are completely air marked, and several other states anticipate speedy completion of their programs. The Bureau has on record more than 10,000 air markers that have been installed through W. P. A. funds alone. In one western state a large oil company has put in 260 markers. The actual number of markers installed by all agencies is not available, although it is quite safe to say that, in all, more than two-thirds of the cities and towns in the country have been air marked.

The Bureau has published a bulletin on air marking, the value of which is attested by the fact that copies have been requested by several South American countries and by Canada, to aid them in drawing up their air marking programs. This bulletin is now being revised, and will in all probability be ready for distribution by the time you read this.

All in all, the government is doing everything in its power to encourage communities throughout the United States to air mark themselves. Compared to other civic projects of equal importance, air marking is extremely inexpensive. Its actual value, sad to say, is almost inconceivable to the average groundling. But practically any pilot can tell many a tale of harrowing moments of trying to identify the terrain over which he is lost. Many a life has been saved by an air marked community.

The air marking program is an important one, not only to the thousands who are flying today but to the tens of thousands who will be flying tomorrow. It will play its part in the continued growth of aviation even as the development of paved, well-marked highways spurred the growth of motoring.

END

160,000 "uneventful" miles...

As flight officers check in at the end of an exacting schedule at great airports all over the world, "uneventful trip" is their usual report to operations executives.

Contributing significantly to this routine phrase is the work of the Sperry Gyropilot, Gyro-Horizon and Directional Gyro. Their accuracy and reliability have helped make possible new standards of performance the world over. On commercial air lines alone, 160,000 miles a day are flown with the Gyropilot... 160,000 miles that Sperry has helped to make "uneventful"!

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So You Want to be . . .

(*Continued from page 38*)

theory on the ground in the training school and by working the Link Trainer. Couple this knowledge with the information and areonautical engineering he has learned in accumulating his 1,000 hours or more (required before he was even acceptable as an applicant) and you have basic background necessary for one of the co-pilots on a modern airliner today.

Finally, when this six weeks' training period is ended, he is summoned again to Captain Lester's office and presented with a several-hours-long written and oral examination on the theoretical and practical points covered in his schooling.

Once safely past this he is sent to the chief pilot of the route he is being assigned to fly, and for the next two or three weeks he rides as the third pilot in the crew of a regular scheduled airliner, merely as an observer. On these observation flights he learns the general terrain of the country he is to fly over, the airway aids at the various airports and other facts and knowledge about the country he will be looking down on in the months to come from the right hand side of a giant airliner cockpit.

These observations completed—and the young officer acquainted with the terrain, the equipment he is to fly and the organization of the company he is to work for—the chief pilot makes application to the Department of Commerce in Washington for authority to allow that pilot to function as a First Officer in flying planes over that particular route. If, for some reason, this pilot at a later date should be transferred to some other division of the airline, he would have to make the same series of observation flights over that route and the chief pilot of that division would, in turn, have to write the Department of Commerce, making application for his authority to fly that route.

All of this done, the authority from the Department of Commerce forthcoming, the applicant is then ready to step forth in a neat, trim uniform as a qualified First Officer on a 90-day probationary period, during which time his actions and flying ability are closely studied. If, at the end of that period he still is qualified in the minds of the chief instructor, operations manager and chief pilot of his flying division, he is placed on the permanent payroll and his career as a pilot for a commercial airline might be declared to be well under way. However, every 45 days he must pass a physical examination and at all times he is subject to the approval of Bureau of Air Commerce inspectors.

Having learned all these facts from Captain Lester we fell into a discussion of the turnover, the place for new men in the pilots' ranks and the various preliminary training schools from which these new pilots would be selected.

"Since January 1, 1938," Captain Lester said, "American Airlines has hired 14 new co-pilots. These men are the cream of some several hundred who submitted their applications and were considered for positions, but through one fault or another were weeded out along the line. The 14 men all went through the training school with flying colors and are now regular First Officers on the line. In two years they will be eligible for positions as Reserve Captains and as time goes on and vacancies occur among the ranks of the present Captains—or the need for more Captains is felt because of increased flying schedules—these men will advance."

Of the 241 men listed at present on the pilot rolls of American Airlines, the great majority of them received their preliminary training in the military service of Uncle Sam. The Army predominates in this list, although the Navy and Marine Corps both offer a sizeable representation.

In summing up the requirements of an airline First Officer today Captain Lester seems to have hit the nail on the head when he said:

"A First Officer must know everything, and say nothing; must be alert and responsive to new changes in the industry; know not only the territory over which he flies but make a study of other routes in his spare time; must have the character of Shirley Temple and the health of Tarzan; be willing to start at a comparatively small salary and work upwards the hard way.

"He should never complain because the other fellow seems to be getting ahead faster, because if he has the stuff his time will come. And come it will. The final results are worth the effort."

Captain Lester should know. He used to be a co-pilot himself.

END

Model Dept.

(*Continued from page 58*)

out causing any undue strain on the framework.

Each wing panel is now given a light coat of water, top and bottom sides. Pin around outer edge upon a flat surface to prevent any warpage while drying.

Carving Propeller

This type of propeller is known as the true pitch. If it is carefully cut into blank shown on the plan, the carving will be greatly simplified. It is very important that the propeller be perfectly balanced in order that you gain the maximum results. A spinner may be added if so desired.

All details such as wing slides, head rest and wind shield are clearly explained on the plan.

Flying the Model

The rubber motor is comprised of from four to six strands of 1/8" flat rubber. The latter amount would naturally give more speed but less duration. After the wing has been attached to the fuselage by means of rubber bands, place one finger at either end of wing at a third of the way back from leading edge. If model is properly balanced, nose will point down slightly. Next glide model gently from hand on an even downward angle (into tall grass preferably) in order to prevent any damage while testing.

If the nose should drop suddenly, move wing forward slightly. If the nose raises abruptly when launched, move wing slightly to rear. When the proper setting is had, model should glide gently to ground.

A test flight may now be made by winding the propeller 75 to 100 turns.

END

YOUNG MEN NEEDED

In the rapidly expanding field of metal aircraft construction where the shortage of trained technicians is a definite problem.

Qualify for these well paying positions by taking advantage of

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Division of Luscombe airplane corp.

West Trenton New Jersey

Aviation's Miracle Man

(*Continued from page 50*)

Toward morning, the wind rose dangerously and Vaughn, fearing loss of the expensive ship, ordered the repaired motor started.

"I'll fly it back to the field," he explained. His associates protested volubly, but Vaughn brushed the protests aside. He took off and immediately realized his mistake. The ship bucked and dived and shook dangerously in the wind and darkness, finally being deposited in an orchard. The ship was torn to bits and Vaughn was thrown 30 feet to the ground while a rain of shattered dirigible parts fell around him. He had a badly sprained ankle which forced him to walk with crutches.

The company had a spare dirigible but no spare pilot and the company manager cursed the ill luck when Vaughn arrived on crutches.

"This means," he deplored, "we lose our contract."

"Why?" inquired Vaughn blandly.

"Why?" sputtered the dirigible manager. "Because you . . you, you, you. . . .

Finally, he regained his speech faculties:

" . . . . because you can't fly."

"Who said I can't fly?" demanded Vaughn. "I'll fly, crutches and all."

Hobbling to the spare ship, he climbed on the framework, threw away the crutches, and flew, saving the day and several thousand dollars for the exhibition company.

When Curtiss, in 1910, made his historic flight between Cedar Point and Euclid Beach on Lake Erie, Strobel and Vaughn watched the flight with great interest.

"That is what we need," ventured Strobel, "an airplane."

"I'll build one," volunteered Vaughn, although he had never seen an airplane at close range. He assembled plans, a quantity of bamboo and cloth and varnish and an old motor built for a dirigible, and built what was known as a Curtiss pusher No. 1. Later he built about 30 more, quite a bit like it.

Then came the job of flying it. He learned, entirely without instruction, by taxying about the field, then making little jumps, then longer jumps. Then with Art Smith, Victor Carlstrom, and Charles Niles, he started on the road, making exhibition flights at the fairs and parks and elsewhere.

An incident will serve to show his resourcefulness. While making a flight at Shreveport, Louisiana, the propeller of his ship tore loose. Vaughn landed straight ahead, in a fence, before a huge crowd, and was deposited, chagrined but unhurt, plane seat still with him in the middle of the field, while the airplane stayed on the fence.

Immediately began the work of repairing the ship. The ship itself needed only some wires, pieces of wood, and cloth—but the motor, built by Lincoln Beachey for a dirigible, was grievously damaged. Its crankshaft was broken and a quantity of silver solder was needed to weld it. But the silver solder couldn't be located.

"I guess," ventured a member of the outfit, "we're sunk."

But he reckoned without Vaughn.

"Here," Vaughn extended a $20 bill to one, "go out and get this changed into dimes."

And with $8 worth of silver dimes they soldered the broken crankshaft and soon had the ship back in the air again in time to save their contract.

Soon Vaughn quit the exhibition business and quit building planes on his own hook, and joined Curtiss who then was working at Hammondsport on the forerunners of the famous "Jenny," probably the most famous ship ever built. He frequently rode Curtiss' famous old motorcycle to town for sorely-needed parts, working with Lawrence Sperry and Henry Klecker. He helped Curtiss built the first tractor biplane and also helped develop the JN 2, 3 and 4 series.

Vaughn has been intimately acquainted with virtually all the "big names" in aviation—Curtiss, Doolittle, Lindbergh, the Wrights, Williams, Bettis, Beachey and the others but regards Curtiss as the greatest builder and flyer of them all.

When the World War broke out in 1914, Curtiss asked Vaughn to accompany him, and they set up a little experimental shop at Newport News, Virginia, working out many problems for the Curtiss factory.

One of the acute problems of the day was with the wooden propellers used universally. The bolt holes frequently wore, loosening the propellers and frequently causing trouble. So Curtiss and Vaughn set out to remedy the trouble.

"I'll never forget those experiments on the beach at Newport News," said Vaughn. "We worked in a little shack, with temperatures sometimes below freezing, sometimes all night."

With a coal stove and a metal ladle, they melted rosin, pouring the hot rosin into the propeller hub bolts, and found that solved the trouble, giving propellers two to four times as long a life.

And here Vaughn almost got into trouble with a mistake that turned out all right. A special ship was built in a Curtiss factory and was sent to Newport News for assembling and testing. Vaughn set up the ship, pronounced it satisfactory, and ordered it up for a test.

But in the air, the ship staggered and cavorted, and Vaughn began frantically waving his arms and shouting ineffective orders to the pilot to land. Finally the pilot got her in safely.

"I don't know about that ship," he mumbled as he sought the warmth of the little shack. "It's got me. It does everything backwards."

Vaughn hurriedly but quietly poked in her "innards" and then asked the pilot.

"Will you try her now?"

The ship flew perfectly this time. The controls previously had been connected up backwards—but no one ever learned of that until years later.

"Curtiss was a great man," said Vaughn, "an exceedingly thorough and patient man, who could always seem to get to the bottom of any problem quickly but always was tolerant of his men."

When the World War began, the Curtiss factories quickly became seething beehives, working on orders for the U. S. Army and Navy. Vaughn was placed in various executive positions with the Curtiss company, and under his direction, 6,000 "Jennies" were built.

When the Curtiss Engineering Corporation was launched at Garden City, Long Island, for developing new ships, Vaughn was put in charge of one experimental building, finally becoming factory manager of the Garden City plant.

"During those war days," he said, "we really built airplanes—all we could build. The supplies—wood, wire, cloth and metal parts—rolled into the plant in carload lots and the planes rolled out in carload lots daily."

Vaughn still treasures a complete set of the original JN-4 drawings, one of the few sets left in existence.

Since the war, Vaughn has had numerous experiences in helping to develop and build famous planes, among them the Curtiss *Hawk* which for years was flown by Al Williams; the two racers in which Williams and Cyrus Bettis

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raced for the Army-Navy championship at Mitchell Field; racers for Doolittle, and others.

He also has among his souvenirs the original spinner cap taken from the Spirit of St. Louis and autographed by Lindbergh, one of the few Lindbergh souvenirs outside of museums.

Lindbergh, on the eve of his famous flight to Paris, was having trouble with the spinner on his Ryan monoplane and sought one to replace, and went to the Curtiss factory at Garden City in the quest for one.

Getting Lindbergh off from the crowd, Vaughn inquired as to his needs, quickly found the cap he needed and put it on. A mechanic was about to throw the old spinner on a junk heap when Vaughn ordered:

"Put it under my desk in my office."

Then Lindbergh made his famous flight.

"I realized then that that spinner was a really valuable souvenir—but not without Lindbergh's autograph," said Vaughn. "For two years I tried to get near him to get him to autograph it. But I couldn't . . . because of the crowds.

"Finally, I gave up, threw the spinner under my desk again. And then Lindbergh, alone for once, walked into the factory. He willingly autographed it."

The ships built for Williams and Bettis (after whom Bettis Airport at Pittsburgh was named) were identical, both being little biplanes with fuselages of monococque construction, and equipped with Curtiss D-12 engines. Miraculously enough, they weighed, when completed, within three-quarters of a pound of each other. Bettis won the race and Williams lost—which fact nearly broke Vaughn's heart, since Williams, in anger, tore out the side of the fuselage.

Williams' famous *Gulfhawk* was originally built for Jimmy Doolittle, the former Army ace—a fact little known. It was damaged by Doolittle and for several years sat, abandoned, at the Curtiss factory at Garden City, until it was rebuilt to Williams' specifications.

One feat of which Vaughn is especially proud was a new record for producing a batch of three military planes for a South American country. The buyers presented their specifications, asking a plane quite similar to the Curtiss *Hawk* equipped with Wright *Cyclone* engines, and then demanding:

"The ships must be ready for delivery within 30 days."

"Impossible," said the Curtiss executives. "We can't design, buy materials, build, and test those ships in such a short period."

"Let's try it," urged Vaughn.

The ships were completed and accepted in 27 days.

"Today," Vaughn believes, "the big future of aviation rests in the private flyer. Civilian aviation has a future that is unlimitetd, particularly in light planes, and that means mass production.

"And we're ready to begin mass production of light planes."

END

Build A $100 Hangar

(*Continued from page 52*)

feet, can be finished as best you know how as it can be considered as a separate part of the hangar with its own roof supports and using only the two middle posts for two corners. The rest of the job of nailing on the V-strips and piecing the steel roofing is merely hard work.

The doors are the accordion type, three on each side, running on overhead track. Strangely, you will find this one of your toughest jobs in building the hangar. Have a good carpenter around for awhile to get these doors hung right. Each door is held by barrel bolts on the inside and out.

So you think this hangar will blow away if a good stiff wind would come along? Well we're not finished yet. In order to keep the metal covering from weathering we cannot have it too close to the ground, therefore, the bottom framework all around must be at least two feet off the ground.

All around the hangar, dig a ditch three feet deep and wide enough to hold 2x6's. These should be thoroughly creosoted. Now 1x8 inch strips, or other scrap lumber 1 inch thick is nailed to the bottom of the frame of the hangar and to this strip in the ground to close up the gap.

The ditch is then filled in and you can defy anything outside of a real typhoon or hurricane to blow your hangar down, especially if you use good-sized spikes. And, incidentally, that roof will hold more weight than it ever will be called on to handle.

Now, get out the paint-brush and paint. Throw a big painting party some nice day and in no time at all the hangar is painted. You furnish the refreshments. (*That will be* $100 *alone, Ed.*)

Here is an idea of material costs, with many of the items and quantities of each you must buy. If you buy all your lumber the hangar will cost you about $100 for material. But, you must use a large portion of second-hand lumber. If possible get second-hand lumber for the whole job.

Forty-three 7-foot pieces of 28-gauge three "V" crimp steel sheeting will cost about $17. In the 10-foot lengths you will need 28 pieces at $16. Twenty 8-foot lengths, $9; seven 12-foot lengths, $5; seven 6-foot lengths, $2.40.

(Don't let these figures frighten you.)

Six hundred lineal feet of wood "V" strips and 11 pound of 1¾ roofing nails will cost about $4.20. Yellow or white pine is the lumber to use. 52 feet of 1x8 inch white pine No. 2 will cost about $2.60. Six pieces 1x8x16, 3 pieces 1x8x14, six pieces 1x8x12 at $6.30. Ten pounds of 8 penny nails, 55c. Eleven pounds of 6 penny nails, 55c. Ten pair of second hand 6-inch hinges, $1.80. 1 gross 1¾ inch screws, 50c. Ten barrel bolts, $1.

Gallon of creosote oil, 75c. Ten pound of 20 penny spikes. Pipe for wind sock, $1.25. Two 8-foot lengths of flat steel door track, $1.20.

Two 6-foot lengths of flat steel door track, 90c. One pair of roller bearing hangers, 80c. Between five and ten dollars for delivery charges will be expended if purchases cannot be made near you.

If you need a hangar on that little airport of yours and you can raise even $75 in cash, get going and build it. It's not as difficult as you might suppose.

If you are near Pennsylvania, fly to Hyner some week-end, pay us a visit and see for yourself what can be done with a little bit of change.

END

NEW OPPORTUNITIES FOR YOU

When five men fly around the world in 91 hours; when a young man flies from America to Ireland in 28 hours; when two men fly from Ireland to America in 25 hours; when two other men fly from the Azores to America in less than 18 hours; when these flights follow in quick succession and each is made with unerring accuracy, you have absolute proof of the success of aviation, and of the safety of airplanes when built, and serviced, and flown BY MEN WHO KNOW THEIR BUSINESS.

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"Empire" Builders

(*Continued from page 35*)

formance so pleased the Air Ministry that they ordered one of these designated *Cockle*, fitted with two Bristol *Cherub* engines.

The other ship was the *Silver Streak* (Armstrong-Siddeley *Puma* of 240 h.p.). This was a very orthodox biplane except for the fact that it was made entirely of metal, even to the wing covering! It was a two-place, tandem affair covered with dural and was extensively used by the R. A. F. (similar to our N. A. C. A.) at Farnborough. Again the Air Ministry became interested and ordered two of these ships, designated *Swallow*. As a result of their trials, Short built some two-place fighters, the *Chamois* and *Springbok*, both similar in design, and fitted with a Bristol *Jupiter* of 400 h.p. These were the first all-metal airplanes used by the R. A. F.

Following this series of metal airplanes came the *Satellite*, a small two-seater lightplane built for the 1924 Air Ministry light airplane tests. Fitted with a Bristol *Cherub* engine, it was of all-metal cantilever construction and there was a "camber-changing device" (as flaps were known in those days) fitted for the whole length of the wings.

For years Short had been trying to get the Air Ministry's official approval of the all-metal flying boat. At that time every flying boat in the Navy was of all-wood construction. Finally consent was obtained and late in 1924 a metal-hulled version of the old wartime F.5 (Felixstowe Air Station) slid down the ramp into the Medway. After the Air Ministry received it, it raised much favorable comment because of its advanced hull design, lightness and—most important—because of the water-resisting qualities of the metal hull. At that time the old F.5 (wooden hull) would soon soak up several hundred pounds of water, thereby gradually diminishing the boat's usefulness. This was really the turning point in Short's history for, with the official approval of the metal boat, they could now go ahead and build the ships they had wanted to for a long time.

In 1926 the first Short-designed all-metal flying boat, the *Singapore I* (two Rolls-Royce *Condor III's*), left the works. Its performance outranked that of any of the boats in service, and this boat was procured by Sir Alan Cobham for an African Survey Flight. Leaving the Short works on November, 1927, Sir Alan's party covered more than 20,000 miles before they returned on May 31, 1928, and dropped anchor in front of the plant. After this impressive performance the plane was reconditioned for Air Ministry trials. Several modifications were made to increase the performance. The principal ones were the installation of Rolls-Royce *Buzzard* engines and a newly-designed hull. This was completed in the summer of 1929 and the boat was then handed over to the officials.

As a result of the *Singapore's* performance, an 18-place commercial version was built powered by three Bristol *Jupiter IX* geared engines of 525 h.p. each. This was known as the *Calcutta* and was the first all-metal British commercial flying boat. It had a maximum speed of 125 m.p.h. and a range of 500 miles. As this ship was very successful in tests, the Air Ministry ordered several *Calcuttas* for Imperial Airways, the first of which was launched on February 13, 1928.

With the *Calcutta* in service, Short made a military adaptation and called it the *Rangoon*. It was fitted with the same engines but the wing area was increased, giving it a longer range. Of course all the necessary military equipment was also fitted.

While these flying boats were being turned out, Short did not neglect the smaller craft. Five of these were made, the *Mussel I* and *II*, the *Sturgeon* and the *Gurnard I* and *II*, the latter being for military use. The *Mussel I* was a low-wing all-metal monoplane fitted with an A. D. C. (Aircraft Disposal Company) Cirrus of 60 h.p. This was made for private consumption, but apparently the public didn't care much for seaplanes, for it never became popular. Later the *Mussel II* (D. H. *Gipsy IV*) came out fitted with amphibian gear. By now the company was using this type for experimenting with float gear. The *Sturgeon* (450 h.p. Bristol *Jupiter*) was a three-place fleet seaplane which did not reach the production stage. The *Gurnard I* and *II* were similar except that one was a landplane fitted with a Bristol *Jupiter X* engine and the other was a seaplane using the Rolls-Royce *Kestrel*. The *Gurnard II* was later tried out with Short amphibian

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gear, being at the time the only amphibian in service.

The following years found much doing at Rochester, with new flying boats coming off the line continuously. The enquiring Air Ministry, in the meantime, was puzzling over the possible advantages of a float seaplane over a flying boat with the same weight and dimensional characteristics. As a result they asked Short to build them one. The company obliged with the *Valetta* (three Bristol *Jupiter X. I. F.* engines of 525 h.p. each), built to the same specifications as the *Calcutta*. At almost the same time Sir Alan Cobham again wished to return to Africa. The Air Ministry decided that here would be a splendid opportunity to note the reactions of this seaplane. After all, the *Calcutta* was built from the *Singapore*, and the latter had made the journey before.

In the meantime, the *Singapore II* (four Rolls-Royce *Kestrels*) was produced as an improved *Singapore I*. This new model was cleaned up considerably and because of its performance was put into production.

Early in 1931 reports came filtering through of a new flying boat that the Japanese Imperial Navy had been doing tests on. This turned out to be the K. F. 1 (three Rolls-Royce *Buzzards*) which was built for the Kawanisi Aircraft Company Ltd., of Kobe, which had obtained the license to build Short metal flying boats in Japan. At the time it was the most powerful flying boat in the world and all details were suppressed by the Japanese Navy Intelligence. However, while it was in England, it was said to have put up a very impressive performance. Another customer was France, in the person of the Breguet company, which also undertook the license of Short flying boats, the first type being the *Calcutta*. If you have ever noticed the resemblance of Breguet boats to Shorts, that is the reason.

A new commercial boat made its appearance when the *Kent* was built for Imperial Airways for use on its Mediterranean section of the England-India air route. This was an enlarged version of the *Calcutta* and combined the best features of that and the *Singapore II*, with the *Calcutta* wing and tail section and the *Singapore* type of engine mounting. It was a 15-seater powered by four Bristol *Jupiter X.F.B.M.* engines geared to deliver 555 h.p. each. Later the *Kent* class was renamed *Scipio*.

Tragedy again struck at Rochester when, on the afternoon of April 8, 1932, Eustace Short was found dead in the cockpit of the *Mussel II* which he had been in the habit of flying in his spare time. This left Oswald Short to manage the helm alone.

Two totally different airplanes were made in 1932, both for the R.A.F. One of these was the *Sarafrand*, a six-engined flying boat that had been designed in 1929 and was first tested in the summer of 1932. This 35-ton giant was powered by six Rolls-Royce *Buzzard III* M. S. engines rated at 825 h.p. each. Able to house a crew of ten with most of the comforts of home, it could also be equipped with a 1½ pounder automatic rifle. This boat is easily comparable to the new patrol-bombers by Sikorsky and Consolidated: it had an electric plant, telephones, galley and everything else necessary to a long voyage. Fully loaded, it had a range of 1,450 miles at a maximum speed of 150 m.p.h.

The other boat was the R.24/31 monoplane fitted with twin Rolls-Royce *Goshawk VIII* engines of 720 h.p. each. Affectionately called the *Knuckleduster* because of its tapered gull wings, it was built for the Air Ministry to test the qualities of a monoplane flying boat. The R.24/31 was the first monoplane flying boat built by Short since the *Cockle* of 1923. This ship was also very fully equipped. As yet there has been little news concerning this craft. It is probably being tried out as the forerunner of a new type of patrol boat.

The *Singapore III* which made its appearance in 1934 was little more than a cleaned-up version of the two previous models. About the only difference was the re-design of the interior equipment to bring it in line with modern practice. There are four Rolls-Royce engines in tandem, the front pair are III.M.S. and the rear engines are II.M.S. rated at 500 h.p. each. This was received very well and several squadrons were built.

Another 1934 product was the *Scylla*, a four-engined land transport biplane fitted with Bristol *Jupiter X.F.B.M.* engines of 555 h.p. each. Two were built for Imperial Airways' London-Paris run and were almost identical to the *Scipio* flying boats with the exception of removing the seaplane hull and wing-tip floats and adding an undercarriage. However, the difference in performance was amazing. Where the *Scipio* could carry 15 passengers at 137 m.p.h., the *Scylla* was able to hold 39 passengers and the same payload at the same speed! This is certainly a strong argument in favor of trans-Atlantic landplanes instead of the present boats.

Designed for economy of operation, the *Scion-Senior* appeared in 1935 as a high-wing multi-motored cabin land-or-seaplane. Powered with four Pobjoy *Niagara II* engines totalling 360 h.p., this craft can carry a disposable load of 49 per cent of its weight as a seaplane and 62 per cent as a landplane at a maximum speed of 134 and 140 m.p.h. respectively. It was on this type on which the Short Company ran flap experiments for use on the *Empire* boats. The little *Scion-Senior* was ideal for the purpose since it is practically a scaled down version of the big *Empire*. Incidentally, notice the similarity between the *Scion* and *Mercury*, the upper component of the Mayo scheme.

A subsidiary concern was formed in June, 1936, with Harland & Wolff, Ltd., the well-known Belfast shipbuilders, who will try to invade the landplane field, leaving Short free to concentrate on seagoing airplanes. Known as Short & Harland, Ltd., the new company now is busy building its share of R.A.F. machines under "shadow scheme" contracts. After Major Mayo had convinced the Air Ministry and Imperial Airways on the composite aircraft, without delay these gentlemen sent the order for both components up Rochester way.

Even now, quiet, serious-minded figures are hurrying through the great Rochester works with the problems of a new, larger and more advanced boat on their minds. Recently, a military version of the four-engined *Empire* boat—the Sunderland—passed initial flight tests. Oldtimers like Short have listened too long to the plaudits of the crowds to allow it to let them pause. To them finishing a job is only half the task, another must be on its way.

END

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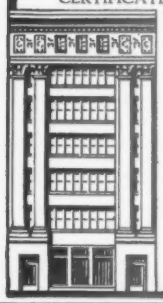

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Bermuda—by Air

(*Continued from page* 19)

London instead of the balmy mid-ocean coral islands of Bermuda. Everything else — service, operations, personnel — were as "New York to London" as they'll ever be.

Not long ago, Wayne Parrish, editor of *American Aviation*, made the same flight. He made the trip in much the same manner as I: New York to Bermuda on Pan American's Sikorsky *Bermuda Clipper* and the return trip on Imperial Airways' Short Bros. *Cavalier*. The resultant article in Parrish's publication gave some 99 per cent of the praise for all-round service on the Bermuda line to the British; the remainder to Pan American—largely because of the fine accommodations of *Cavalier* as compared to the *Bermuda Clipper*. After making the flight both ways I'm afraid I must agree, to a great extent, with Parrish—with one exception. It is a bit unfair not to emphasize the fact that *Bermuda Clipper's* design and accommodations are basically six years old; *Cavalier* is little more than one year old. Five years in aircraft design can be close to revolutionary.

Nonetheless, with all due respect and patriotism to Uncle Sam and my sincere appreciation for Pan American's kindness and hospitality, I'm afraid I'll have to hand the olive wreath to the British; from the passenger viewpoint, that is. So far as operations are concerned, I don't hesitate calling both Pan American's and Imperial's the finest and *safest* I have ever seen. I say safest because of the fine precision job the crews of the *Bermuda Clipper* and *Cavalier* turn in. There is none of the "guesswork" of blind flying while following an easily-swerved radio beam. Both Imperial and Pan American use the radio direction-finding system of navigation (triangulation) which has been proved as foolproof as anything yet devised. Not only does the plane's crew keep a constant check on its position while over the Atlantic but radio stations, both in the United States and Bermuda, plot the plane's position by taking bearings on the craft's signals.

But, getting back to the passenger standpoint, there really is little comparison between *Bermuda Clipper* and *Cavalier*. The British flying boat is as spacious as the six-year-old American ship is compact. Both have approximately the same performance, while *Cavalier*, I believe, carries a better payload than the American ship, although *Bermuda Clipper* has a little the better of it when it comes to range.

To the passenger who flies one way on Pan American and the other on Imperial, *Cavalier* is far and away the highlight of the round-trip flight. Frankly, I've never seen so much room. A six-foot man standing in any of the ship's four passenger "decks" cannot touch the ceiling with his hand held straight above him. The four passenger compartments are *downstairs*—literally! The crew operates the ship from the "second floor," completely apart from the passengers. Going from the tail forward, each of the passenger compartments is stepped down about one foot below the level of the preceding compartment. The compartment farthest forward is for lounging and smoking.

Short Brothers, builders of *Cavalier*, surely took great pains in behalf of the passenger when they designed the Empire-type flying boats for Imperial Airways. The adjustable individual seats are masterpieces of comfort; far more comfortable than the "ultra-special" lounge chairs publicized so eloquently by domestic American airlines. Before each seat is a sort of collapsible table that is as suitable for cocktails (made and served in flight by the two stewards) as for the sumptuous full-course dinner that is served somewhere out over the Atlantic.

Pan American and Imperial do an equally fine job of both quenching your thirst and satisfying your appetite. A typical dinner menu looks like this:

Chilled Grapefruit Juice
Iced Celery Mixed Olives Sweet Gherkins
Creme St. Germain
Rolls Crispbread Butter
Broiled Half Spring Chicken
Roast Potatoes
String Beans
French Salad, French Dressing
Pear Melba
Assorted Cheese and Biscuits
Demi Tasse Dessert After Dinner Mints

And it tastes even better than it looks on the card. Of course, both Pan American and Imperial stewards handle their passengers flawlessly. All this, mind you, about 10,000 feet above the clouds and ocean and some 400 miles from the nearest land. When you are not eating you may be standing at *Cavalier's* promenade rail and windows (in the photograph, those closest to the wing and directly beneath it), or you may be chatting with the captain who usually comes downstairs to pass the time of day with his passengers.

No matter what you do, though, there's never a dull moment. It's as quiet inside as the quietest train. There is always a congenial group of passengers aboard at least one of whom will take you up on a game of cards, a drink or just conversation. If there is a photography fan aboard (there usually are several each trip) over-ocean flying is ideal for him. He may get a shot of a speck of an ocean liner or freighter plowing through the waves far below. If not, he is sure of getting some of the most beautiful cloud shots he's ever seen. Then, too, there is plenty of light coming through the windows into the compartments; indoor photography offers little difficulty here.

Beside all this, however, there is one important addition—which no American can build into any airplane—that is, the good old British hospitality. Let patriotic Americans say what they will, they have to go a long way before catching up with John Bull's polished touch in public relations. The Briton always has been the

perfect host; Imperial Airways personnel personify that reputation in grand style.

The Americans, on the other hand, seem to spend too much time being Americans. Especially down in Bermuda, away from the American atmosphere, the curt, sharp, belligerent attitude of the Yankee looks very shabby beside the Britisher's charm. Pan American's men are unquestionably among the finest of Americans. They treated me as decently as anyone could ask for. But somehow Imperial's men, from Capt. Griffith J. Powell down, seemed to make things so much pleasanter with "that added touch." An example of British thoughtfulness is the fine leather letter wallet in which Imperial Airways hand each of their passengers his ticket. The passenger's name is engraved in gold on the wallet's face. The American way, in contrast, is simply to hand you a gaudy paper envelope. Naturally I'll carry that wallet—and advertise Imperial Airways indefinitely, whether I want to or not.

Pan American's organization seems to operate flawlessly. One who is steeped in domestic airline operations marvels at Pan American's smooth efficiency in operating both its Port Washington base and its airline between New York and Bermuda. Like Imperial, Pan American is operating on that route now in exactly the same manner as she will between the United States and Europe. *Bermuda Clipper* carries a crew of seven, including the two stewards. One and sometimes two of the flying crew usually is a newcomer making the flight as part of his training. An interesting point—and one that speaks volumes for American efficiency—is that the five men who serve as the ship's flying crew each are capable of handling any other post aboard. For instance, the navigator is just as proficient at the post of radio operator, and vice-versa. In addition, all five men usually are experienced airplane pilots. That in itself is astonishing. The Captain is, of course, a veteran who has flown thousands of miles across the Pacific, Carribbean and through South America.

Naturally, the Imperial Airways' airmen compare equally. The Bermuda-New York pilots now based at Bermuda (Imperial maintains its base there; Pan American's base is at Baltimore) are veterans of Imperial's routes which extend from England through the Mediterranean, Africa and India to Australia. Captain Powell, recently appointed general manager of the Bermuda line for Imperial, is the pilot who flew many of the trans-Atlantic survey flights in Empire boats identical to *Cavalier* in the summer of 1937.

So, if you're impatient to see planes flying from New York to London and want to get "in" on how it will be done even before the first passenger is flown to Europe, I suggest you vist Pan American's base at Port Washington next time you're in New York. Better still, treat yourself to one of the finest vacations you have had in years and fly to Bermuda and back; one way on *Bermuda Clipper*, the other aboard *Cavalier*.

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Flying Without Power

(*Continued from page 23*)

of pilots flew in from hundreds of miles around to see my beautiful Minimoa with its highly polished, natural wood finish. One and all they admired its beauty of line, but with few exceptions they questioned its strength. When I told them that it would stand a dive up to 200 m.p.h. with a sharp pull-out they were amazed. If they still remained unconvinced I had only to take off the gap covers and show them the heavy steel wing root fittings of the monospar wing which look as if they would stand even more than the 20-ton load for which they were designed. All this extra strength is built into these ships so that they can withstand the extreme turbulence often to be found inside large cumulus clouds while trying for altitude.

The monospar "D-tube" construction of a highly tapered, full cantilever wing developed for sailplanes has been copied in several airplane designs. The latest in this country is the Ryan two-place cabin ship which used this type of construction in an all-metal wing. Perhaps the most striking examples of large airplanes following soaring craft design are the latest four-motored bombers built in Germany and this country.

For years we gliding enthusiasts have pointed out the advantages from the viewpoints of safety and practicality of the "tricycle" type of landing gear. Gliders have always landed in this level position. With the wings in a non-lifting attitude and the landing wheel or wheels behind the center of gravity a landing requires far less skill and it is almost impossible to turn over. A few years ago, at the end of a 156-mile cross-country soaring flight, I was forced down in a small field on a rocky hillside. The airspeed indicator showed better than 60 m.p.h. as I landed. As soon as the wheel touched I pushed the stick hard forward and pulled on the brake. The skid dug into the ground and I came to a dead stop in less than 40 feet! The tricycle gear idea is not new, as Curtiss used it on his 1912 pusher—but it has returned to stay and I feel that this has been hastened by the increase in glider flying.

In the field of meteorological research, soaring is playing an ever increasingly important part. It is my own greatest personal interest in devoting my time and energies to promoting the sport. A soaring pilot who makes scientific observations and records of his flights is a real pioneer in a vastly important field which influences every human being. It was with such ideas in mind that I organized, for the Soaring Society of America, a small expedition to Texas to test the aerological conditions over our great level plains.

Before leaving for the west I received a great deal of encouragement from the meteorological committee of the Air Transport Association. Invited to speak before them in Chicago I met the chief meteorologists of ten major airlines who frankly told me some of the problems they are up against. At the conclusion of the meeting, at which I told of some of the conditions I had encountered while soaring, the chief meteorologist of TWA (E. J. Minser) said that he sincerely felt that soaring pilots will be able to get a better cross-section picture of what goes on in the lower part of the atmosphere up to 10,000 feet by observations made during soaring flights on unstable days, than can be obtained by any other means.

Arriving at our base at Wichita Falls, Texas, the first week in April, I started daily flights from winch-tow launchings. In my cockpit I carried, in addition to a complete set of flight instruments, a thermometer and hygrometer to record temperature and relative humidity of the air at intervals throughout the flight. These recordings, together with a complete account of everything encountered during the flight were added to the information received from radio meteorographs sent up daily on balloons to great heights by Dr. Karl O. Lange of the Blue Hill Observatory of Harvard University. Dr. Lange, who also acted on the expedition as official observer for the NAA and the International Student Commission for Motorless Flight is chairman of the contest committee of the Soaring Society of America.

On April 19th came the day for which we had been waiting. Shortly after 10 o'clock in the morning, small white puffs of cumulus clouds began to appear in the sky. Winch-towing to 900 feet I stayed up seven and 16 minutes respectively on two trial flights before I caught thermal upcurrents sufficiently strong to carry me to my announced goal of Tulsa, Oklahoma. Seated in the cockpit after the second landing I left the cockpit cover open as I jotted down notes of these short flights while I waited for the car to retriever the 4,000 feet of manila rope that stretched between the ship and the winch.

When the boys arrived, one of them slipped the metal ring at the end of the rope into the release in the nose of the ship and then picked up the red signal flag and lifted my wingtip to a level position. The other fellow drove the car well out onto the field to pass on to the winch operator the flag signal to start. Closing and latching the plexiglas enclosure I shouted "All set". The flag waved from side to side and the second flag repeated the message to take up slack. As the rope came taut and the ship began to move, the flags were dropped and I shot forward with swift but steady acceleration.

Lifting off easily in a short run I pulled the stick back more and more as

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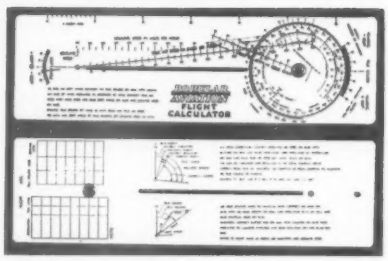

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I gained altitude rapidly. The swishing of the wind increased to quite a whistle as the airseed showed more than 50 m.p.h. In short order I was over 900 feet high and at an angle over the winch where I would soon start being pulled down so I dipped the nose and jerked the release knob. With a sharp click the rope dropped off and I nosed up to gain more altitude with the excess speed remaining.

Gliding upwind to the south of the field at an air speed of 38 m.p.h. I sank at two to three feet per second, the normal rate for this high performance sailplane. Down to five hundred feet I suddenly felt the ship tremble slightly and the variometer needle moved up to indicate a climb of three feet per second. Moving the stick over and pushing a little rudder, I wheeled about in a wide spiral. Previous experience had taught me that these rising "bubbles" of comparatively warmer air were rather wide and not very strong in intensity over the Texas plains at that time of year and that they could be used to best advantage by making wide turns at minimum sinking speed. I was now gliding down at two feet per second in a body of air that was going up at better than five feet per second which carried me steadily up to 2,500 feet altitude as I continued to spiral to stay within it. I now knew that the flight was at last really started. Off to the southeast the cumulus clouds were growing quite large over the Wichita River so I headed cross wind toward them.

Approaching a long line of these clouds which we call a "cloud street" I encountered good lift of seven feet per second and rose spiralling to the cloud base just over 3,000 feet. Now I experienced the real thrill of soaring—climbing rapidly upward with the only sound the swishing of the wind and with a complete absence of vibration. This is real flying—for sheer pleasure no power plane flying can hold a candle to it.

These new ships are what we call "shoulder wing" designs. The roots of the gull wings are actually opposite the pilot's shoulders. It has been my experience that when you have had sufficient practice with such a sailplane and are tightly strapped in and unconsciously make the necessary motions with the stick and rudder pedals, you often actually feel as if you are flying with your own wings. This to me is the greatest single thrill that can come to an airman in his flying career.

During the first hour of this flight I was once forced down to only 500 feet near the junction of the Wichita and Red Rivers when only 15 miles on my way. I knew that my best chances of finding a thermal boost to keep me up would be over a large, dry, plowed field over which the sun's radiation would heat the air more rapidly than over the darker fields which would absorb the heat. Sure enough, I found a strong one and again rapidly rose to the level of the cloud bases. During the remainder of the flight, while the clouds rose from 3,000 to 6,000 I was never below 2,500 feet.

The general technique of cross-country soaring, which I used on this flight, is to choose only the clouds which are still growing and climb up on the thermals producing them to their bases and then head off to the next best one, flying rapidly through the downdrafts and circling slowly in the updrafts. If the wind is strong as you progress cross-country with it, your average speed measured on an airline and not actual course may be as much as 37 m.p.h., as mine was on this trip.

A few times I hit thermals of over 13 feet per second which, for the benefit of the power plane fraternity, is around 800 feet a minute. One of these I rode to an altitude of over 6,000 feet, the last 500 of which were on instruments in a big cumulus. That put me within a few hundred feet of the altitude record and I would have gone higher, but the turbulence became so bad that I could no longer continue with safety. Steadying the compass down on "E" and trying to hold her level with the ball bank and straight with the electric turn indicator I soon came out into the clear.

The latter part of my flight was made cross to a strong wind. Four and a half hours out I passed Drumright, Oklahoma, and had the satisfaction of knowing that I was comfortably past the necessary five per cent over the former record to establish a new one. Five hours and 47 minutes after the take-off I set the Minimoa gently down in front of the Spartan School of Aeronautics on the Tulsa Municipal airport after having covered 212 miles for a new American distance record as well as goal flight record. This was also the first long distance soaring flight ever made over absolutely level country from winch tow.

During the past few months soaring has received great impetus from this level country soaring. In California John Robinson of San Diego took off from Clark Dry Lake in Borego Valley. Catching a powerful thermal at only 400 feet he remained aloft over five hours, covered 50 miles, and reached the astounding altitude of 10,200 feet. In Detroit Elmer Zook climbed 4,000 feet in a utility glider and landed 36 miles away on the lawn of Edsel Ford's estate, thereby gaining national publicity. At Akron, Ohio, Richard Randolph flew his sailplane to over 7,000 feet in a cumulus cloud. At Hicksville, N. Y., Emil Lehecka, senior pilot of the Airhoppers Gliding and Soaring Club of Brooklyn, reached 4,500 feet, stayed aloft two and a half hours, and made a wide circle over central Long Island. At Pitcairn Field, near Philadelphia, Samuel Freeman of the Wings Soaring Club which I organized last year, became one of the first pilots in the country to win his "C" license by thermal soaring. He had been gliding for over eight years and had made several long trips to slope soaring sites only to be disappointed by lack of wind. This July he caught a thermal after releasing from

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the winch tow at 700 feet and climbed in it up to 1,100 feet, remaining aloft 9½ minutes. The following week he climbed the utility glider to 3,800 feet on a 20-minute flight.

I am convinced that the sport of gliding and soaring will not only grow to be a great national sport, but also an increasingly important branch of aviation. The results at this year's annual National Soaring Contest, the ninth held at Elmira, N. Y., far exceeded those of any previous contest, a real indication of rapid growth. I think it more than probable that, as the undoubted value of motorless flying becomes more generally known, our government will help to develop it with substantial subsidies. The first step is already being made in Tennessee where gliding and soaring have been boosted considerably.

In the not too distant future I can visualize many thousands of boys and girls, men and women all over the country experiencing the thrills of soaring flight. When this comes true those of us who are now working for proper recognition of this flying without power will be amply repaid by the knowledge that we have played a worthwhile part in the general development of aviation.

END

Federal Inspector

(*Continued from page* 48)

could come over and take a flight test he had instructions to give me.

Fouts turned out to be a pretty decent fellow, impatient of the red tape and regulations. He was a war veteran with several German planes to his credit. He showed me a lot of things about flying that I didn't know. He himself got into an altercation with someone in Washington shortly after I met him and left the inspection service.

Two months and twelve days after it was suspended I received my license back with no comment.

My relations were of the best after that and I met a number of inspectors in various places. A few were broad-minded, experienced men. Barnstorming up and down the country for several years I finally settled down to a job as instructor and manager of the airport at Warrington.

One day soon after my arrival at Warrington a tall gangling sort of fellow came to the field, looked around casually and said he was Ed Harris, inspector for the Department of Commerce. Everyone at the field liked him immediately, including myself, who still had an idiosyncracy against inspectors. We got along fine and became good friends. Through his urging and coaching I applied for a job as an inspector, little thinking I would be accepted because of my former difficulties.

Ed has stayed on through the years, known and liked everywhere. He says he's too lazy to get out and go to work.

So I became an inspector after a period of training which took me through the miles of red tape and showed how to avoid some of it, the executing of expense accounts in such a manner as to comply with the rules and still not lose money out of my own pocket, and the proper conduct and manner of an inspector.

Regarding the latter, Ed Harris told me before I went to Washington that the best way to be an inspector was to try *not* to be one. I learned how true this was when I saw the officiousness and pomposity of some of the boys in Washington.

I was ordered to report to Leo Philson, district supervisor at Spencer. He ran his district with all the Imperialism of a Romanoff. One of his ideas of a good inspector being that the more applicants the inspector disqualified, the better inspector he was.

Philson in turn assigned me to New Ulm as my headquarters and I had a large slice of territory to cover from that point. I was kept pretty busy with inspections. We had to inspect every airplane in our territory once every six months, in addition to giving all the examinations to applicants for license. Any request for help was met with the sarcastic implication that if I was no'

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big enough to handle the job . . . etc. I worked hard.

The life of an inspector is not all milk and honey. While the job, even with all the work we then had of inspections every six months, is not tremendously hard, there are many little irritations that tax one's patience. For example there is the chap who comes all prepared to show how good he is, talks volubly about his exploits, but when it comes to passing even within reasonable limits of the requirements—fails miserably, is much incensed and feels that he has been given a dirty deal when told he must try again. Some of this type are the most dangerous because they cannot understand that they are not as good as they think they are. The pitiful part is that they always seem to have someone with them when they get into fatal trouble.

Another is the girl pilot all set to give the world a thrill. She poses coyly, rolls her eyes and simpers at the inspector and has no more business at the controls of a plane than I have at the tiller of a ship at sea. I have incurred the hearty dislike of some of these girl pilots by bluntly telling them they were on a flying field and not in a drawing room. There is one good thing about girl pilots. They will hardly ever apply for a license unless they are sure they can pass the requirements. Unlike their men contemporaries who will often take a chance on getting by.

There are many things an inspector is required to do in addition to the regular routine inspection and test work. There is the enforcement of regulations and many are the trifling ways attempted by some to get by with something they know to be wrong. For instance: there was a regulation in force at one time that prohibited dual controls in a passenger-carrying ship. Removing them was a job and most pilots wouldn't remove them if they could get by without doing it.

Another one the boys still infringe on is the rule about parachutes. It is required that a parachute be worn whenever any stunting is to be done. Stunting is defined in the regulations as "any maneuver not necessary to the navigation of the airplane." But every once in a while an inspector must look the other way and not see things that are technically violations and therefore subject to fine or revocation of the pilot's license.

I was approached once by Al Munk, operator of a sales service at Casper for permission to allow his eight-year-old son to have a picture made while at the controls in flight, the picture to show the dual controls and the boy as the sole operator. The idea being to show how easy it was to fly the plane. I refused permission. The stunt also was to be used by a local newspaper as a news item and they evidently telephoned the U. S. Representative, Mike Aldige in Washington, because that evening I got a telegram a yard long ordering me to explain how come, whereas and so forth.

Still, the permission was not granted. The boy was too young in the first place and didn't have a license in the second. Munk was an enemy from that time on. During the last few months at Warrington there came a most interesting experience. A man came up to me as I was watching a solo student perform some exercises.

"I'd like to take lessons and learn to fly," he said.

I explained the requirements as to student's permit, told him the doctor's name and said I'd have to have the permit in order to legally give him flying instruction.

He returned to the field several hours later, downcast and discouraged. He said the doctor refused him a permit.

"I've never wanted anything so bad in my life. I don't see why I cannot fly. I drive my car all right and there isn't much if any difference in the depth perception required to drive than to fly. I wear glasses of course but I can see all right."

I called the medical examiner. His reply was, "I refuse to give that man a student's permit because his eyes will not correct to normal even with his glasses. I don't care how many automobiles he drives, he is not going to fly if I can help it. His depth perception test was awful and is not anywhere near the requirements prescribed by the Bureau of Air Commerce medical section."

The depth perception test given to pilots is called the Howard test after the inventor, Dr. Howard. It consists of two sticks placed side by side in a frame. These sticks slide forward and back and are operated by two strings in the hands of the applicant who is seated 20 feet away. The object is to bring these sticks opposite each other when looking at them in perspective. An average error of 30 millimeters is allowed in five trials. There are many men flying who cannot accomplish this test within the required limit. They could at one time but some whose vision has failed with age cannot do it.

I resolved to do a little experimenting because I have always held that this test was not infallible and did not hold true in all cases. Nature is a great compensator.

After giving this man—I'll call him Trine—a few tests of my own devising, such as driving around in his car with him when he didn't know I was testing him, I became convinced he could see as well as I. He drove in heavy traffic, weaving in and out with ease through places where accuracy and judgment of distance was imperative.

He soloed in eight hours and *for ten years has flown without the sign of an accident.* True he has had to fly on the Q. T. but that doesn't alter the fact that he has flown—and with safety. Yet the medical examiner predicted that he could not fly and was a dangerous man to be at the controls.

I do not hold that medical tests should

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POPULAR AVIATION

be done away with entirely, because the presence of organic disease really should be detected and corrected before flying becomes a danger. But the empirical adherence to a set of rules works a hardship on some that is unfair. I believe that military flying should require a first class physical condition but I do not think commercial flying, where there is no close formation work, requires the drawing of such a fine line.

An ideal way to solve this problem would be to have the doctor fly with the applicant in cases where there was a definite question or in the case of a new student to devise some other test through which more latitude could be allowed pending the verdict of the instructor. Late regulations have worked toward this theory for there is no medical examination required prior to application for license.

Another instance along these lines happened to my old friend, Skid Barrett. He had long since become a good boy and bowed to the inevitable regulation. He was flying a regular run for Intercoastal Airlines with a good record. No accidents of any kind, nothing against him in the way of behavior, nothing physical. The company doctor examined him every 45 days as all Intercoastal pilots were examined.

A new airline inspector boarded Skid's ship at Biloxi, riding as co-pilot to Montgomery. His name doesn't matter because he is no longer with the Bureau. When Skid returned to his home terminal he was called in and laid off indefinitely. For some unknown reason the inspector had made a report to the Intercoastal operations chief that Skid was unfit to fly as a regular pilot due to his having difficulty in reading the instruments. Nothing could be further from the truth.

Skid hired an attorney and called for a public hearing.

The findings of a handpicked crew of officials from Washington were in favor of the Bureau. The suspension was sustained. The Bureau is always right.

They gave Skid a job as an inspector shortly after—believe it or not. He's still with 'em.

END

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Letters

(*Continued from page 63*)

fighter that will (equal) these speeds. . . Can't (American) engineers design faster planes?

ROBERT MUELLER.
Pittsburgh, Pennsylvania.

• Reader Mueller can calm his fears. Such hush-hush Yankee warplanes as the Curtiss P-37 and Bell *Airacuda* are not to be ignored.—Ed.

Advice

Sirs:

For some time I have been planning to build a lightplane but as I do not know much about planes I have done nothing about it. . . I have thought of using ½-inch pipe put together with pipe fittings and electric welded. Would that be all right for the fuselage? If not, what would you suggest? . . .

JAMES W. BRISTOW.
Parma, Missouri.

• We suggest that Reader Bristow consider the purchase of an inexpensive second-hand lightplane built by a reliable, experienced manufacturer.—Ed.

Comment

Sirs:

Have just read through the September issue of POPULAR AVIATION. I want you to know what a swell job I think you are doing with the magazine. On my numerous jaunts around the country I hear lots of favorable comment on POPULAR AVIATION.

JACK KNIGHT,
Director of Public Education.
United Air Lines,
Chicago, Illinois.

• Many thanks to Million Mile Pilot Knight (see page 19, POPULAR AVIATION, March, 1938).—Ed.

Warning

Sirs:

. . . You might tell the young lads just out of air schools and raring to fly all over God's skies that these here countries ain't built for novice *pilotos*. The mountains go up too high and the birds walk half the time . . .

FREDRIK DECOSTE.
Lima, Peru.

END

Airports at Sea

(*Continued from page 18*)

the squadrons of another "blue" carrier. *Saratoga* and *Lexington* planes are both on the scene. In they tear. They have caught the enemy carriers with a full half of their planes still on the flight decks. Ten thousand, 8,000, 5,000 feet—below them the decks of the carriers seem to rise into their faces . . . 100 feet . . . they pull out of their dive. Theoretical bombs go crashing all around the ship—and bang! What a swell hit! Right on the deck! No more planes off there, if any are left unharmed. The Umpire rules that carrier temporarily out of commission, but this is not known until later. On to the next objective . . .

What has been going on aboard the *Saratoga* since her cargo of airplanes has been discharged? For a few moments, it seemed strangely quiet as the roar of the planes' engines faded in the distance. This ship, although on specialized duty, is run basically as any other ship of the fleet. Besides the men and officers of the aviation group, there are approximately 1,500 other officers and men aboard who do not wear wings. These men now continue their assigned tasks, stand their regular watches, while the aviation personnel left behind clear the flight deck of unnecessary gear and go below for their breakfast.

Airplanes can remain in the air only as long as their gas supply holds out, and the quantity of gas carried is known aboard ship as well as aboard the planes. Therefore, without receiving any word from the planes, the crews aboard the ship can figure out very accurately the time the planes will return. Men begin to appear on the flight deck, casting their eyes aloft, straining their trained ears to catch the first sounds of the engines.

"It's just about that time," remarks one seasoned aircraft mechanic. Sure enough, simultaneously comes the voice through the loud speakers:

"Prepare to land planes!"

Every man in the aviation group rushes to his place. The huge ship is headed into the wind, and in a few minutes tiny specks appear in the distance. Flying in squadron formation they near the ship, and then the first group forms into single file. Down they come, the signal officer waving them on. In rapid succession, they touch their wheels to the deck and taxi forward, the wings being caught by the waiting mechanics. Sometimes landings are extremely difficult if the ship is rolling and pitching. When this happens, the signal officer must be doubly on his toes, as often a plane must be waved off. This means—straight over the deck without touching, and up and around for another trial. Landing aboard a carrier is like coming into an extremely small landing field which has suddenly developed the faculty, after you have leveled off, of dropping out from under you by 20 feet, or even worse, rising up to meet you by

that much or more. And that isn't the worst of it, from the viewpoint of the pilot. Every unusual landing aboard is photographed for later study purposes. The cameramen are so trained in observing landings that they seem to sense an unusual one before it actually takes place, and they start grinding away on their cameras. A pilot never alibis a bad landing; he doesn't have to. These pictures are taken for the purpose of study only, so that in future landings that particular condition will be familiar and therefore properly handled. This has been going on for years, and each year shows a decided improvement in the technique of landing an airplane aboard a pitching ship.

Just in case an accident might occur in landing, knocking the pilot out and the plane catch fire, two men dressed from head to foot in asbestos are on duty at all times during plane operations. They are affectionately called "Asbestos Jim and Joe" and the "Fire Eaters." Their job is to watch every landing, and should there be a crash accompanied by fire, they are ready to rush into the searing blaze and with their cutting tools, reach the stunned or injured pilot, and get him out before he is burned. Fortunately, these men have rarely been called upon to perform this duty—but they are there "just in case."

For the men in the planes which have just landed comes a much-appreciated call to chow. Just time for it and an extra cup of coffee before they file out again in obedience to the call:

"Man the planes!"

Refueled, rearmed, and rechecked, the procedure of the early hours is repeated. Away they go, over the trackless ocean, to complete the problem or to start a new one, and back again hours later. Just that one thing is a marvelous display of navigational skill. When the planes leave, the ship is at a certain latitude and longitude. The planes fly hundreds of miles, and when they return, the ship will be many miles from the point at which they left it. That is why Navy pilots are expert navigators; else finding their ship again would be just luck—and nothing is left to luck.

This day is but one in the course of a year aboard any of the aircraft carriers. They are not always packed with such activity. There are many other jobs to be carried out besides flying. Hours are spent by the mechanics going over the planes and engines, polishing and checking, inspecting every stay and wire. Do the pilots then have a chance to take it easy? They do not . . . they turn to on their practice of radio and navigation; their study of ship silhouettes and the gunnery manual . . . never an idle moment. Sometimes there are long waits on the flight deck or in the Ready Room for orders to come through, watches to stand, routine inspections to be made. Up before the sun has begun to think of appearing, and making ready for flying, or any other operation which may be called for.

Occasionally there is a casualty. Another pilot steps into the vacant place, and the training goes on. Weeks and weeks of this work, and then the annual fleet maneuvers are completed. Back to the home port and shore leave!

It is hard to realize that these bronzed officers and men who walk smilingly up the streets of the port towns with the roll that comes from long periods at sea, apparently carefree and trying to squeeze so much amusement and relaxation into one evening, are the same serious-faced, tense individuals who such a short while ago were so alert to bugle calls and to the orders coming over the loud speakers of the ships.

Not long before they were performing their wartime duties far at sea with stern-faced precision. Not long before they had been sitting tensely in the cockpits of their sleek bombers, scouts and fighters as their ships' hammering engines dragged the heavily loaded planes off the rising and falling deck of the carrier. Not long before these men hardly showed that they had any feelings common to humans.

Yes, they are the same men who, in addition to flying, have been spending many long hours pushing planes, answering early morning reveille, working out problems and doing all jobs with a display of the finest kind of loyalty to superiors, to ship, and to the Service. In their hands we may confidently place the responsibility of our protection. For nowhere on the face of the globe will you find better!

END

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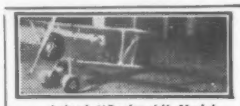
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Where Are the Aces?

(*Continued from page 30*)

manding the 13th Aero Squadron; he took up pactice of law in the City of Brotherly Love, became a partner in the firm of Drinker, Biddle, and Reath. He abandoned flying except as a passenger.

Major Reid Chambers of Memphis, former member of Eddie Rickenbacker's Hat-in-the-Ring Squadron, a seven-time combat winner, has reported that he stopped flying as a pilot in 1927. He gradually came to spend a lot of time, however, flying around the country in connection with the aviation insurance business which he and his partners organized in New York.

Sumner Sewell, who won seven victories while a member of the 95th Aero Squadron, returned home following the war and resumed his studies at college, graduating from Yale in 1920. He became associated with the development of Colonial Air Transport, is a member of the Maine state legislature and director of United Air Lines. He became a frequent user of the airlines but dropped his pilot's license.

Thomas G. Cassady became a member of the investment firm of McGowen, Cassady and White of Chicago. He served with Escadrille 157 of the French Army, later joining the 28th Aero Squadron. His record shows six victories. He tells your reporter: "I have personally done very little flying since the war. Not so long ago I flew a plane up to Minneapolis and had prickly heat all the way. I landed without mishap but made a mighty resolve to let the youngsters do my flying from then on. However, I use passenger planes regularly."

Colin A. Mackenzie, captain in the Canadian Royal Air Force, won six battles. After the war he followed aviation and became identified with the management of Lincoln Airport, Los Angeles. James Knowles, Jr., five-time winner as member of the 95th Aero Squadron, reported to your correspondent that he had become assistant general manager of the St. Louis division of the United Drug Company. After the war he organized and became Commanding Officer of the first Massachusetts National Guard air squadron. He gave up piloting in 1930 although he is an enthusiastic user of airlines. He reports:

"All of my friends who continued to fly after the war are either dead or haven't had a job for four or five years. So, regularly, once a year, I get off in a corner all by myself and pat myself on the back for three hours and a half for having had sense enough to stop flying sometime ago."

Frank K. Hays, of the 13th Aero Squadron, credited with six victories, returned home after the war to engage in banking. He became vice president of the Lake Shore Trust and Savings Bank, Chicago. Major Victor Herbert ("Vic") Strahm, who commanded the 91st Aero Squadron and won five victories, holds the rank of major in the U. S. Army Air Corps. Bogart Rogers, formerly captain in the 32nd Squadron, Royal Flying Corps, with five official tallies, writes aviation stories for the nation's leading magazines.

David S. Ingalls, former Assistant Secretary of the Navy in charge of aeronautics, was the only United States Navy ace. He downed five enemy aircraft. His intense interest in aviation is evidenced by his private landing field at his Chagrin Falls, Ohio, farm, and his pleasure in private flying. He was twice a member of the Ohio legislature and is active in Ohio politics. He received 400 hours of flying time in France and has since piled up, he reports, more than 1,200 hours as a private pilot.

It was inevitable that when motion pictures got around to making war aviation pictures, technical experts would be drafted from the ranks of World War pilots. William A. Wellman, who scored three official and four unofficial victories as a member of the French Flying Corps and who has decorations from three governments, leaped into fame with his production of "Wings", first of the great war aviation epics. He then made "Young Eagles", "Legion of the Condemned", "Star Witness", "Frisco Jenny" and "Public Enemy", achieving today topnotch rank among Hollywood directors.

He directed the top money picture of 1937, "A Star Is Born" starring Janet Gaynor. While he has given up active flying, Wellman still takes over the controls from time to time. One of his close friends is the daring Paul Mantz. They go cloud-hopping together frequently. A few days ago Wellman hopped into a rebuilt wartime Jenny and went upstairs for a few vertical banks.

Here's how Wellman got his start in motion pictures: it was after the war and "Wild Bill" as he is known in Hollywood, occupied an obscure position at one of the major studios. General Pershing was coming to the studios for a visit and the orders went down the line for all war veterans to turn out in uniform. Bill put on his flying uniform and made his appearance.

As Pershing marched through the jungle of props and Klieg lights, he spotted Wellman. Without a moment's delay he shouted, "Hi, Bill!" and left the escort of high-powered executives waiting while he walked over to talk about war experiences in France. The two had been great friends over there, and hadn't met since the big fracas ended. That meeting drew executive attention to Wellman at the studios and from that day he began to climb in the film industry.

His latest production is "Men With Wings", a Paramount technicolor picture. (*See* POPULAR AVIATION *for* ***July.***)

Associated with Wellman in producing "Wings" was Edwin C. Parsons. Back in 1913 Parsons went to Mexico and became a Mexican Army pilot. To qualify for this job, he had been through two years of strenuous and hazardous training on nearly every type of ship existing in that now-dim day, beginning on Bleriot monoplanes. He served with the French Army and accounted for eight enemy aircraft. He became technical adviser to Howard Hughes in producing "Hell's Angels" and since 1928 has been widely known and very popular as an aviation story writer. On the radio he conducted an eight-months program called "Heroes of the Lafayette Escadrille". He and Byron Morgan wrote Warner Baxter's picture, "Hell in the Heavens".

He tells your reporter: "I haven't flown a great deal in recent years, having no particular desire to do so and finding no great pleasure in it. There are many wartime pilots here in southern California, but with very few exceptions they are engaged in other pursuits than flying".

Writing also attracted Guy Gilpatric, who began flying in 1912 when he was 16 years old. Shortly before the end of that year, he set a United States altitude record with a passenger, climbing to 4,665 feet. He became captain in the 1st Aero Squadron and after a spectacular career in this country as a writer, moved to France where he lives in his own villa and continues to write thrilling fiction air stories.

Thus we bring to a close this partial accounting of the whereabouts and occupations of the World War ace pilots. Space does not permit the listing of all members of the aerial fighting forces who survive today, or even of those who have a few notches on their machine gun butts. It would be, actually, an almost impossible task to obtain personal word from all of them telling what they are doing today and how they regard their war experiences.

END

Odds and Ends

(*Continued from page 50*)

Wood at the ceremony of "cutting the first sod" on the site of Lord Nuffield's air rearmament factory.

The Air Minister stated that this "initial order" for fulfilment at the new factory covered 1,000 Supermarine Spitfire monoplane fighters, which have been officially stated to be the world's fastest military aeroplanes. Their maximum level speed is in the region of six miles a minute. "Spitfire" design was the last work of the late R. J. Mitchell, world-famous designer of the seaplanes that won for Britain in perpetuity the coveted Schneider Trophy. The low-wing monoplane is heavily armed and equipped for day and night fighting. It is a "stressed skin" airplane, built chiefly of duralumin alloy. Power is derived from a Rolls-Royce Merlin 1,050 h.p. liquid-cooled engine.

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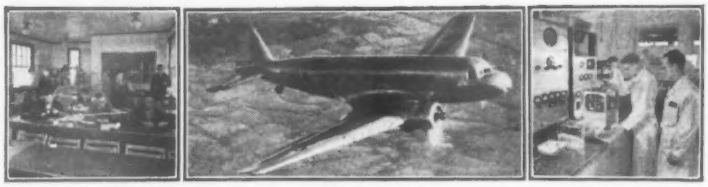

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